

MECHANICS • AUTOS • HOME IMPROVEMENTS

POPULAR SCIENCE

March 35c

MONTHLY

How to Build This
Outboard Hot Rod

PAGE 112



8 SPECIAL
FEATURES

Spring Boat Fair

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You'll Soon Ride
2-Headed Trains

PAGE 122

New Spark Plug Invention!

SELF-CLEANING, 21 POINT Nickel-Cadmium SPARK PLUG



U.S. PAT.
NO. 1305446

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Spark area
from 21 or
more points

- TESTS PROVE:
- ★ 10 HORSEPOWER GAIN
- ★ 9 MPH GREATER SPEED
- ★ 15% FUEL SAVING

OIL INDUSTRY RESEARCH DISCOVERS AMAZING ELECTRODE SECRET

Research engineers of leading oil companies recently revealed that nickel-cadmium is the most perfect material yet developed for the electrodes of spark plugs designed for modern high-compression, internal combustion automobile engines. The nickel-cadmium solid electrode of the Life-Long Plug has ideal characteristics of extremely high conductivity and durability, being able to withstand temperatures of 3500° indefinitely.

BUILT-IN CADALLOY CATALYST

These same research engineers also discovered that a new alloy (which we call Cadalloy) introduced into the combustion chamber of a plug, acts as a catalyst to produce the most efficient fuel combustion. Life-Long Plugs are the first to use this important discovery!

LIFE-LONG NICKEL-CADMIUM PLUGS ARE GUARANTEED TO:

- 1—End plug replacement costs
- 2—Step up engine horsepower
- 3—Increase your gasoline mileage
- 4—Improve acceleration
- 5—Give smoother idling
- 6—End engine knock
- 7—Never need regapping

With the introduction of sensational new-type Life-Long Nickel-Cadmium Plugs, the spark plug is no longer the "most troublesome, most often-replaced" part of your automobile. In fact, you will never have to replace the plugs in your car once you install a set of Life-Long Plugs!

LIFE-LONG—WORLD'S ONLY PLUG WITH FULL-CIRCLE FIRING

Life-Long's revolutionary "ring of fire" principle is the first major improvement in plugs in 25 years. Instead of small "spot" spark arcing between the same two points, the Life-Long Plug makes a hot spark 400% to 500% greater in volume, spread around the entire circumference of the solid electrode. The piston stroke of today's high-compression engines is so powerful that it can actually "blow out" the spark produced by old type plugs. Blowing out is impossible with Life-Long's full-circle spark.

Heat is spread around the full perimeter, resulting in cooler electrode temperature. The causes of wear, burning and insulator failure are eliminated.

SELF-CLEANING. Because the Life-Long Plug fires simultaneously inside and outside the shell, fuel moisture is ignited at the same time a powerful turbo wiping action, created by the piston stroke, burns and blows out the carbon. Power loss is prevented and you get greatly increased horsepower and gasoline mileage. In a series of road tests, some cars have shown 10 horsepower gain, mileage increase 15% and more.

ATTENTION, OWNERS OF 12-VOLT AUTOS.

Conventional plugs, designed for 6-volt electrical systems, do not function well in modern 12-volt systems. Life-Long Plugs are designed to handle twice the voltage capacity of 6-volt systems. If your car has a 12-volt system, don't be misled—only Life-Long gives you full plug efficiency!

LIFE-LONG PLUGS ACTUALLY COST LESS!

A set of Life-Long Nickel-Cadmium Plugs will outlast six or more sets of ordinary plugs. You end replacement costs completely. Yet the set of 8 Life-Long Plugs costs only \$8.95 each. Set of 8 only \$11.95.

ORDER REGISTERED SET FOR YOUR CAR NOW.

Life-Long Nickel-Cadmium Spark Plugs come to you in a tamper-proof, laminated plastic container. Sealed at the factory, your Life-Long Plugs are not touched until you break the seal.



PLEASE NOTE: The Life-Long spark plug is different in every way—not just an "improved" plug, but an entirely new engineering development!

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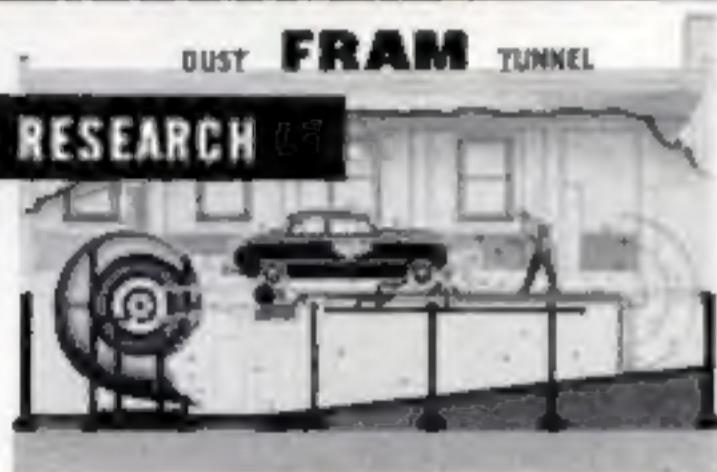
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Founded in 1872
Vol. 168; No. 3

**POPULAR
SCIENCE**
THE SCIENCE MONTHLY

Mechanics and Handicraft
REG. U.S. PAT. OFF.

America's Leading New-Idea Magazine for 84 Years

MARCH, 1956

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**SO EASY
SO SIMPLE
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No. 1755L

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"I switched because, with cone design, it's trouble-free at night and in the wind," says John Cook, of Minneapolis.

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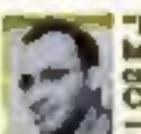
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Training plus opportunity is the PERFECT COMBINATION for job security, good pay, advancement. In good times, the trained man makes the BETTER PAY, GETS PROMOTED. When jobs are scarce, the trained man enjoys GREATER SECURITY. NRI training can help assure you more of the better things of life.

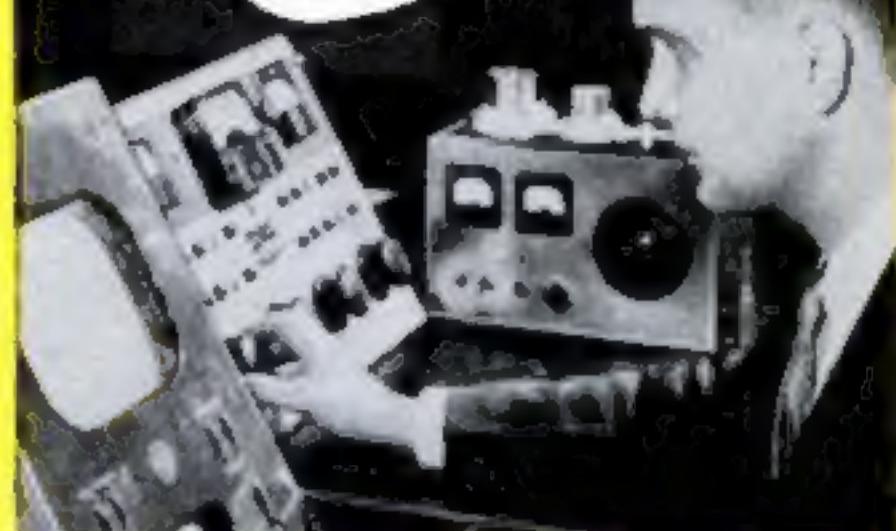
Start Soon to Make \$10, \$15 a Week Extra Fixing Sets

Keep your job while training. I start sending you special booklets the day you enroll, that show you how to fix sets. Multimeter built with parts I send helps you make \$10, \$15 a week extra fixing sets while training. Many start their own Radio-Television business with spare time earnings.

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You benefit by my 40 years' experience training men at home. Well illustrated lessons give you basic principles you need. Skillfully developed kits of parts I send (see below) "bring to life" things you learn from lessons.

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Television Making Good Jobs, Prosperity — Even without Television, Radio is bigger than ever. 116 million home and auto Radios are big market for servicing. 3000 broadcasting stations use operators, technicians. Government, Aviation, Police, Ship, Micro-wave Relay, Two-way Radio Communications for buses, taxis, trucks, R. R. are growing fields. Television is moving ahead fast.



About 200 Television stations are now on the air. Hundreds of others being built. Good TV jobs opening up for Technicians, Operators, etc.



25 million homes now have Television sets. Thousands more are being sold every week. Get a job or have your own business selling, installing, servicing.

Radio-TV Needs Men of Action—Mail Coupon

Without obligating you in any way, I'll send an actual lesson to prove that my training is practical, thorough; 64-page book to show good job opportunities for you in Radio-TV. Terms for NRI training are as low as \$5 a month. Many graduates make more in two weeks than total cost of training. Mail coupon now. J. E. SMITH, President, National Radio Institute, Dept. 6CB, Washington 9, D. C. OUR 40TH YEAR.

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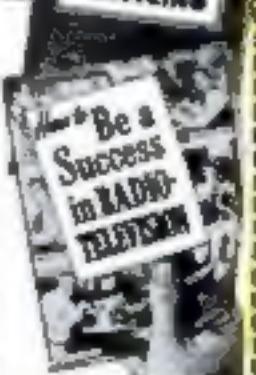
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The ABC'S OF SERVICING



NEW, EXCITING SEX HORMONES MAKE FISH BITE LIKE CRAZY!

Quick-Easy-Convenient To Use!
Just Dab On Your Favorite Bait,
Drop In Water And Fish As Usual!

Are you down on your fishing luck? Have you been coming home recently with an empty creel? Have you invested hard-earned cash on the latest fishing tackle, fancy lures and bait—only to be frustrated time after time? No matter how unlucky you've been, this new discovery may change all that—quickly! Now, at last, you too can use a secret that professionals have tried with astounding results—a secret that even a schoolboy can use to catch more fish, no matter what the weather, bait or tackle. Yes, you can even get big ones out of what the misinformed call "fished-out" waters. And you can do it with your present fishing methods and equipment! No need for special bait . . . whether you fish in a river, lake, pond or the open sea . . . whether you cast, spin, troll or do still-fishing . . . this new discovery will give you the thrill of your life!

SCIENTISTS DISCOVER STRANGE HABITS OF SEA LIFE

Man has been fishing since the dawn of time. Yet during countless centuries he's never really known much about sea life. Then leading scientists from all over the world got on the job, including the U. S. Dept. of Fisheries. Ichthyologists, chemists, zoologists and sportsmen joined in the quest. Millions of dollars were spent on gigantic glass aquaria, sub-marine cameras, recording devices and lab equipment. In less than a generation man learned more about the mysteries of sea life than in the previous 10,000 years!

EXPERIMENTS PROVE FISH ARE ALMOST BLIND

Here is the most startling discovery that the scientists unearthed: most fish—of ALL species—have very poor eyesight compared to birds and mammals. Some are almost blind! No wonder, then, that you can use the most attractive dry lures—yet go home after a day's fishing excursion with little to show for it but a sunburn!

It doesn't make much difference how good the bait is you use nor how hungry a fish may be—if he doesn't SEE it, if he isn't DRAWN to it, you won't get a nibble! And test after test proved that unless you get the lure right under the fish's nose, you simply cannot attract him to your hook!

NEW SEX-HUNGER FISH LURE DEVELOPED BY GERMAN CHEMIST

The new Lurene formula was developed by a German chemist, a graduate of the University of Tübingen in Württemberg, Germany. An acknowledged leader in his profession, he knew that certain lures and bait failed simply because many fish were nearly blind. But he learned that Mother Nature in her bounty provided fish with extra powerful sense-instincts that led them irresistibly to their food supply.

FAMOUS SPORTS EDITOR PRAISES LURENE FORMULA

Millions of readers follow Walter S. Miller's sports column, "Rod, Gun & LENS," which appears in over 15 metropolitan newspapers. He tests new products thoroughly, warning readers against shoddy, defective articles but also giving praise where praise is due. This is what this great sports authority says about LURENE:

"Recently a product called 'Lurene', a prepared bait oil came into my possession with instructions to test it and pass on my opinion to you. Accordingly here are the results on several such tests."

"Using an artificial lure of the spoon type in salt water the number of casts per fish was 27. With 'Lurene' the number of casts per fish was 8. Accordingly this product is active enough in salt water fishermen since tests prove it will triple your catch regardless of type of fish. Again using an artificial lure of the spinner type in fresh water the number of casts per fish was 38. Using 'Lurene' the number of casts per fish was reduced to the phenomenal low of 10 casts per fish. The results proved beyond doubt that in fresh water 'Lurene' quintupled the catch. I heartily endorse this product."



TEST IT YOURSELF THIS EASY WAY!

No elaborate equipment required! An ordinary glass aquarium tank and ANY species of fish will prove this new method really works! Drop in 1 or 2 lines with your favorite bait. Treat only ONE with the new LURENE "triple-instinct" preparation. It's the same bait . . . the same lure . . . yet right there before your eyes you'll be witnessing a fascinating spectacle! You'll hardly believe your eyes! The fish, as if compelled by some unknown power are drawn to the Lurene-treated line. This article explains how this "triple-instinct" in fish can increase your fishing luck.

This sense-instinct for want of a better name may be called Smell-Taste. In other words, a fish both SMELLS and TASTES at one and the same time! For this purpose, the bodies of fish are covered with thousands upon thousands of tiny smell organs—without which life would be impossible. Armed with this knowledge, the eminent chemist finally developed the now famous Lurene formula.

NOW!—SEX FACTOR ADDS EXTRA "PUNCH!"

Scientists have long known that the sex factor is one of the most compelling instincts in sea life. Fish go to fantastic lengths to fertilize their eggs. They travel countless miles to fertilize them—go through incredible torture, accomplish almost impossible tasks. One of the most wondrous sights of nature is to watch male salmon struggle up river fish-ladders to fertilize the spawn. NOW—for the first time ever—natural sex hormones have been added to the new Lurene formula. This has increased production costs considerably—but you'll agree after using it that it's certainly worth it! And it's SO easy to use—just dab a little on the plug or bait, drop it in the water and fish as usual. LURENE works in lakes, streams, ponds or in the ocean. It makes no difference if you still-fish, troll, cast or spin. Lurene disperses in the water, giving

you greater penetration, longer range and far more attraction power.

RESULTS GUARANTEED

OR IT DOESN'T COST YOU 1¢

Now you can try Lurene at our risk! It must help you catch more fish—faster! Lurene must prove to be the best scent lure you've ever used—or your money back! You're invited to try it without obligation. We want you to see for yourself how Lurene releases its deep, penetrating "call" into the surrounding waters. See how the mysterious instincts of the sea world help attract fish to your hook. And—if this you can be sure: Lurene really works—it positively helps draw 'em in! So we say: try it and judge for yourself. See if you don't get the big ones—even in "fished-out" waters! Use it to pull in your favorites . . . trout, pickerel, catfish, blues, weaks, pike, perch, bass, shiners, porgies. You need send no money now. Simply deposit 1.00 plus postage with your mailman when the Lurene arrives—or mail 1.00 now for immediate prepaid shipment. But please remember: you're trying—not buying! Unless you're satisfied in every way with this new, different product, it won't cost you a penny. Rush the coupon now while supplies are available to:

LURENE CO., Dept. 7-C-10

332 Fourth Ave., New York 10, N.Y.

Change Your Fishing Luck-Mail Coupon Today!

LURENE CO., Dept. 7-C-10

332 Fourth Ave., New York 10, N.Y.

Rush—1.00 packages of Lurene on 5-day Free Trial. It is guaranteed—the formula must help me catch more fish. It must give me thrilling results. Otherwise, you will refund my 1.00—no questions asked.

\$1.00 enclosed—rush prepaid.

Send C.O.D. plus postage.

Name.....

Address.....

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SPECIAL OFFER: Save \$1.00 by ordering 2 packages for only \$2.00. Send check, cash or m.o. on this offer as we cannot ship C.O.D. at this low price.





IF you're that man, here's something that will interest you.

Not a magic formula—not a get-rich-quick scheme—but something more substantial, more practical.

Of course, you need something more than just the desire to be an accountant. You've got to pay the price—be willing to study earnestly, thoroughly.

Still, wouldn't it be worth your while to sacrifice some of your leisure in favor of interesting home study—over a comparatively brief period? Always provided that the rewards were good—a salary of \$4,000 to \$10,000 and up?

An accountant's duties are interesting, varied and of real worth to his employers. He has standing!

Do you feel that such things aren't for you? Well, don't be too sure. Very possibly they can be!

Why not, like so many before you, investigate LaSalle's modern Problem Method of training for an Accounting position?

Just suppose you were permitted to work in an accounting firm under the personal supervision of an expert accountant. Suppose, with his aid, you studied accounting principles and solved problems day by day—easy ones at first—then more difficult ones. If you could do this—and could turn to him for advice as the problems became complex—soon you'd master them all.

That's the training you follow in principle under the LaSalle Problem Method.

You cover accounting from Basic Accounting right through Accounting Systems and Income Tax Procedure. As you go along, you absorb the principles of General Accounting, Auditing and Basic Cost Accounting. Then you may choose Commercial Accounting, Industrial Accounting or Public Accounting and prepare for the C. P. A. examinations.

Your progress is as speedy as you care to make it—depending on your own eagerness to learn and the time you spend in study.

Will recognition come? The only answer, as you know, is that success does come to the man who is really trained. It's possible your employers will notice your improvement in a very few weeks or months. Indeed, many LaSalle graduates have paid for their training—with increased earnings—before they have completed it! For accountants, who are trained in organization and management, are the executives of the future.

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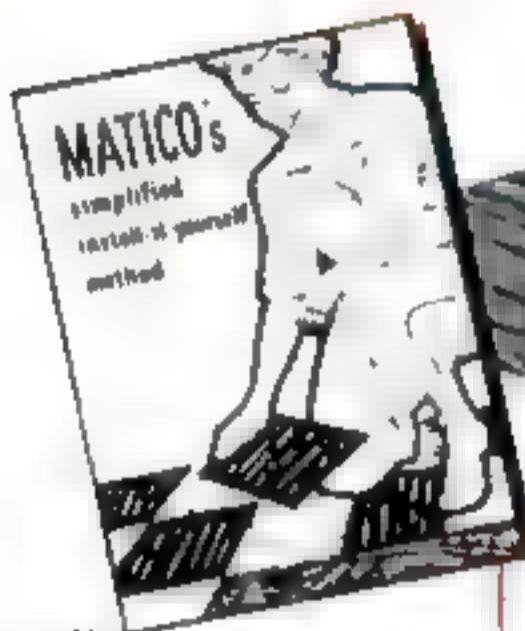
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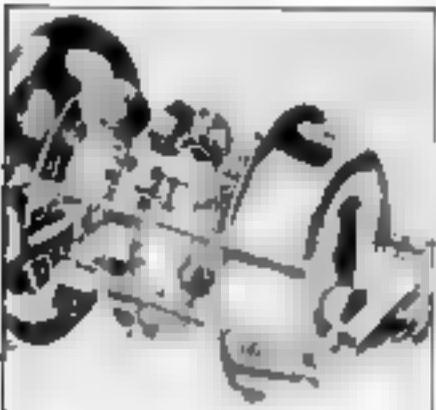
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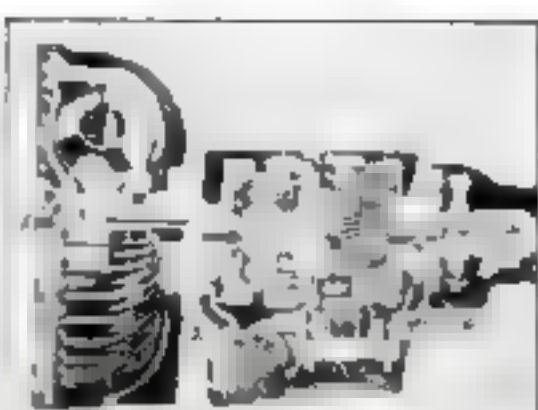
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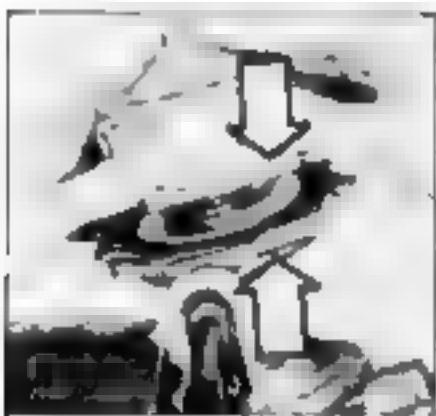


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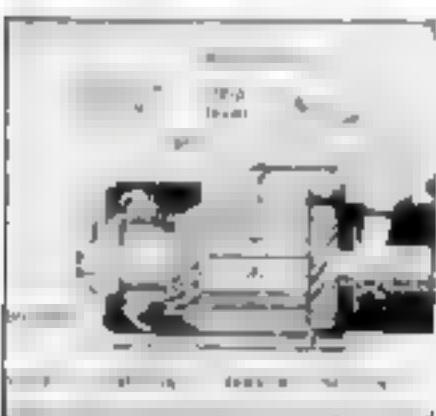


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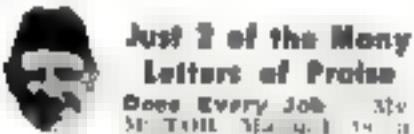
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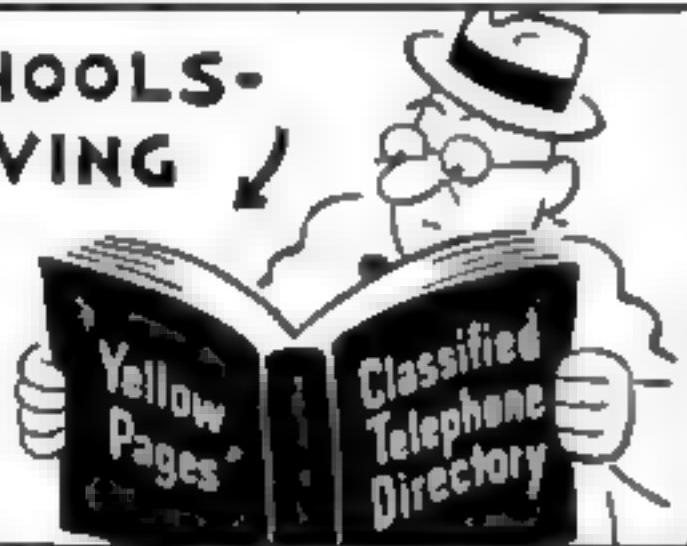
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Letters



PSM Keeps Home Fire Burning

Your highly practical and useful article, "How to Service Your Oil Burner" [Aug., p. 148], was a lifesaver to yours truly last night. At three a. m., with the outside temperature doing a nosedive, the old heating



plant gave up the ghost with a dismal groan. Thanks to your clear illustrations and concise directions I was able to locate the trouble and remove same quite easily.

STANFORD BOB GILLEY, Terre Haute, Ind.

Ball Bearings Are Not Bearing Balls

Being an ordinary machinist, I wondered what kind of "ball bearings" Ross Taylor uses in his trick air gun ["He's Hollywood's Kindest Killer," Dec., p. 128]. A ball bearing has a race or two, a cone and maybe a separator to space the balls. How does he get all that stuff into an air-gun barrel?

This is all in fun, but why not use the correct term? You had it right in the story on the child's race car on page 209 of the same issue.

WALDEMAR C. HANSEN, Los Angeles

The one PSM editor who did not know a bearing ball from a ball bearing knows it now.

A Satellite Suggestion

Your model of the proposed artificial satellite (Jan. '56, p. 124) is very interesting. But why make separate units of the third-stage rocket and the satellite? Since they are both going to the same place, and weight is so important, it would seem to be more efficient just to put the satellite's instruments

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inside the third-stage rocket and let it go on orbiting around the earth.

ROBERT HARE, Barberton, Ohio

Your suggestion is logical but probably not practical. When it is designed, the third-stage rocket will be a standard production item. Each satellite will be tailor-made for its particular job by scientists in electronic laboratories. Also, the rocket, a comparatively large empty shell after burn-out, would not be an efficient orbiter.

Has Jugs, Wants House

The unusual materials used to build houses—such as Mr. Emerson's Styrofoam-plastic home [Dec., p. 81]—interest me very much. I have on hand about 2,000 gallon glass



jugs and I would like to use them to build a house. Is there any particular method or special cement to enable me to do this?

WENDALL C. BRICCS, Virginia, Ill.

Your problem is one on which, oddly, there seems to be no technical literature.

Do Bugs Eat Plastic?

You say that the Styrofoam Mr. Emerson built his house of is distasteful to bugs. It sure isn't distasteful to our Florida cockroaches. They eat it like a kid eats candy, making a crunching noise like a cow in a patch of celery. They ate all the Styrofoam out of a pair of canoe outriggers that I was experimenting with.

EVERETT REID, McIntosh, Fla.

The manufacturer of Styrofoam, Dow Chemical Co., insists, "Styrofoam contains nothing of food value and consequently does not attract rodents or vermin."

Praise for Good Furniture

May I compliment POPULAR SCIENCE for the excellent articles covering the construction of the chairs, table and buffet [Nov.,

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p. 178; Dec., p. 184; Jan., p. 181] designed for PSM by Martin Stan Buchner. There are so many books and articles written on the outdated traditional styles and so few on the contemporary styles. It is refreshing to see an article featuring such good design and simple construction.

JON A. BRADLEY, San Diego

Too Much Adhesive Is Sticky Problem

My husband laid our kitchen vinyl tile a year ago. To this day the black paste is



still oozing up in places where we walk the most. Shouldn't it be dry by now?

MRS. L. M. WINT, Detroit

Apparently your husband was too generous with adhesive. Some types are formulated to stay sticky forever. They never dry. Short of ripping up your floor and starting all over again, you can try to squeeze out the excess cement by going over the tiles with a roller. Wipe up what comes through the joints with a rag soaked in solvent.

Says Automatic Brake Is Old Stuff

Regarding your article, "Out Goes the Brake Pedal" [Sept., p. 121], I've actually driven a car with brains. Its inventor has driven it for the past 14 years.

The single-pedal, semi-automatic control of motor and brake power was designed by Mr. Harley C. Mack in March, 1941! A 1941 Fluid Drive Chrysler, equipped with a Mack control, was driven 200,000 miles before it was junked. The brakes were relined after the first 100,000. A second Chrysler now records better than 100,000 miles without a single replacement or adjustment. The original brake lining and drums are still intact. Gas consumption is lower, tire mileage up.

The brain of Mr. Mack's invention is a power-control valve. It is constructed with heel and toe sections, and has a neutral position. Braking is by the simple backward ankle movement of the heel section of the

INVENTORS

If you believe that you have an invention, you should find out how to protect it. The first step is to have a search made of the prior pertinent U. S. patents. If a report on this search indicates that the invention appears patentable you can apply for a patent, and the specifications and claims should be prepared.

The firm of McMorrow, Berman & Davidson, with offices in Washington, D. C., is qualified to take the necessary steps for you. We can make a preliminary search on your invention, advise you whether we think it can be patented, and prepare your application for patent.

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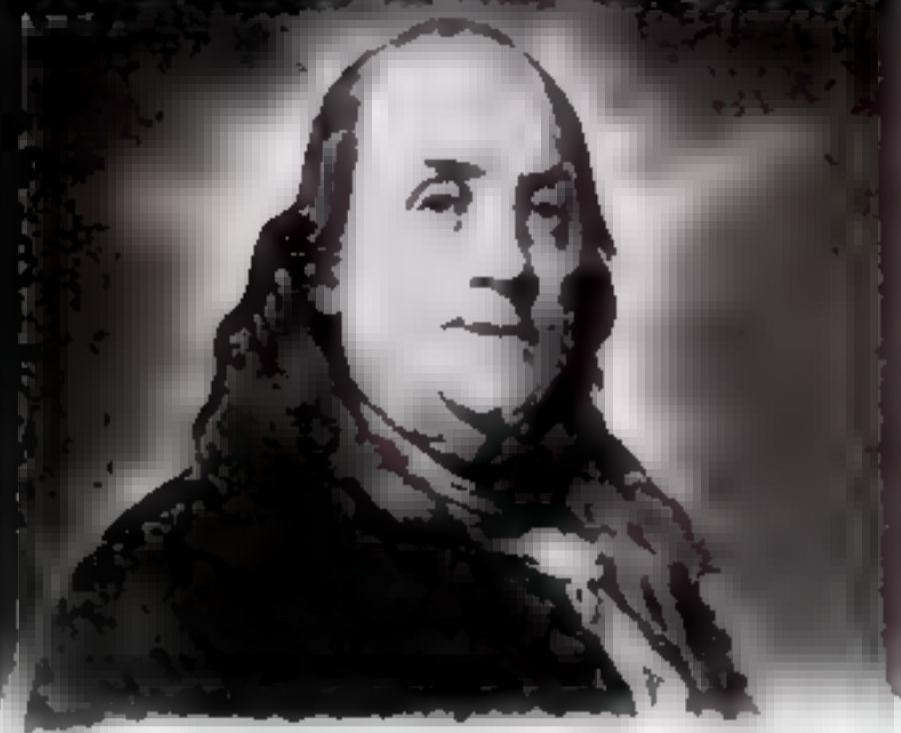
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pedal. Should the operator remove his foot from the control pedal, the brake will apply and stop the vehicle. Mr. Mack is president of Mack Engineering Co., Inc., manufacturers of the Universal Power Brake.

SAM H. RINKER, Joplin, Mo.

Good Braking Is Serious Business

J. Bevin's letter [Nov., p. 14] ridiculing the automatic brake is very funny—maybe. To some people everything is a big joke.

But let us see just how funny this Hemphill automatic brake is. According to the National Safety Council, it takes a car going 50 m.p.h. 220 feet to come to a panic stop. The Hemphill automatic brake panic-stops a car in 128 feet—92 feet shorter. That's serious business and nothing to laugh about.

Z. T. BOGAN, Burtonsville, Md.

PSM Goes to College

In one of my classes at the Collegiate, students make short speeches as part of their term work in composition. I was glad that, when my turn came around, I was able to give a speech on the history of the Lincoln Continental. I don't think this subject would have been possible for me to speak on if it had not been for two articles on the Continental in your July and November issues.



Ross Lowney, Toronto, Ont.

Uranium-Sample Price Corrected

There appears to be an error in your mention of the price of the samples of uranium ore that are used to calibrate Geiger counters [Jan., p. 209]. Our samples are \$2.50 apiece, and our calibration set of four samples is \$10.00.

C. J. RODDEX, Area Manager
U. S. Atomic Energy Commission
New Brunswick, N. J.

Cabbie Shifts Gears with Window Crank

You're right about cab drivers liking the new small taxis [Jan., p. 138]. The only objection that I have heard came from a hackie in a '56 Dodge. He said that the window crank was so near the automatic-shift push buttons that every time he works the crank he changes gears.

EDWARD C. CASS, Lexington, Mass.

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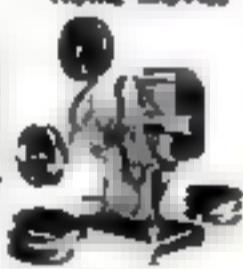
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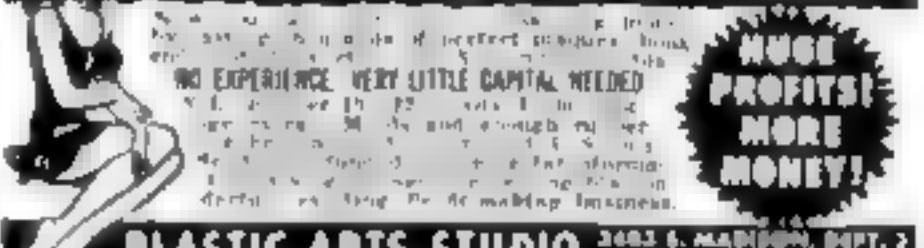


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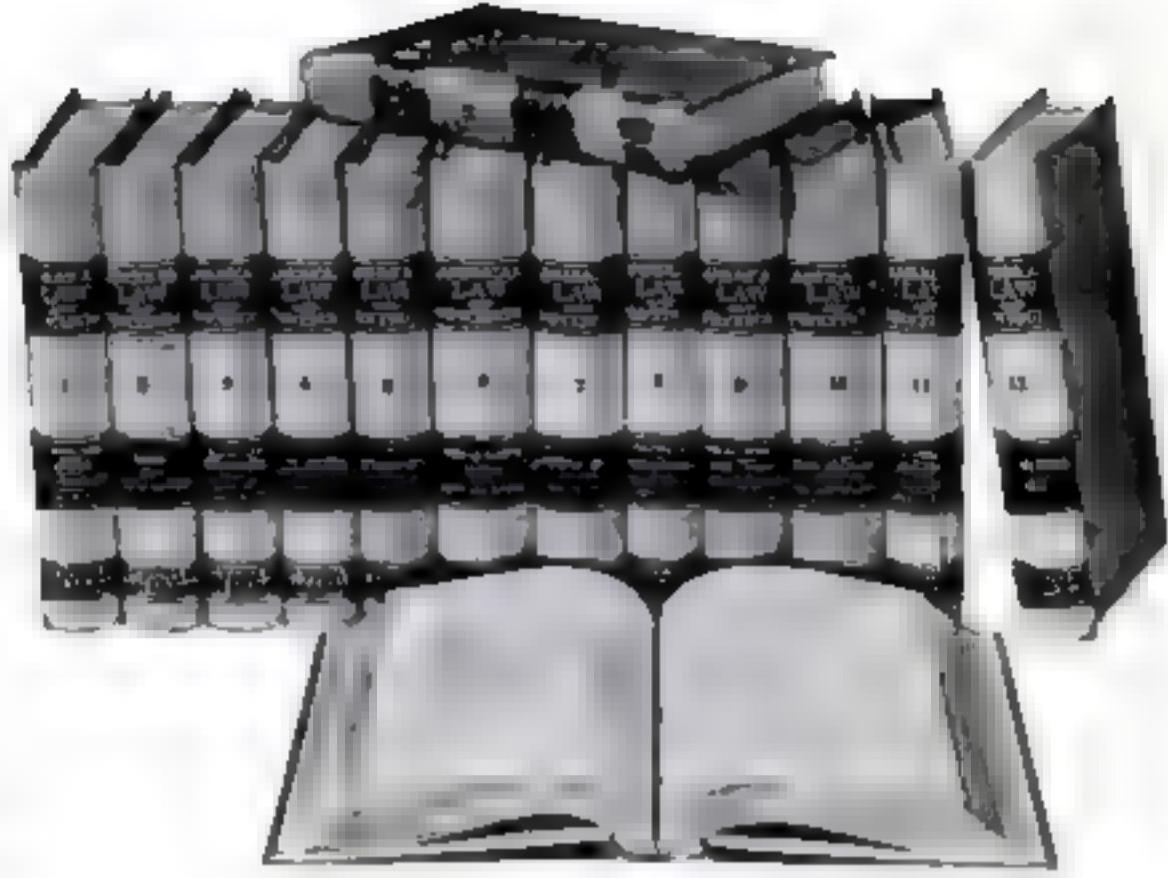
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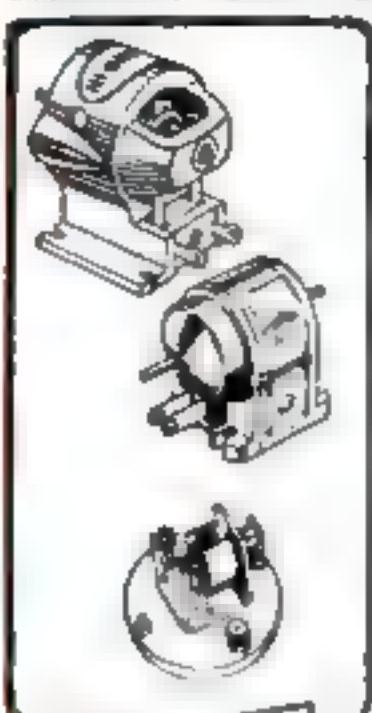
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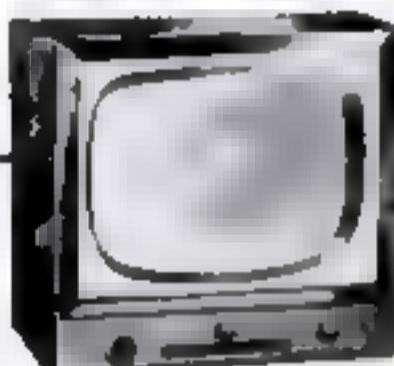
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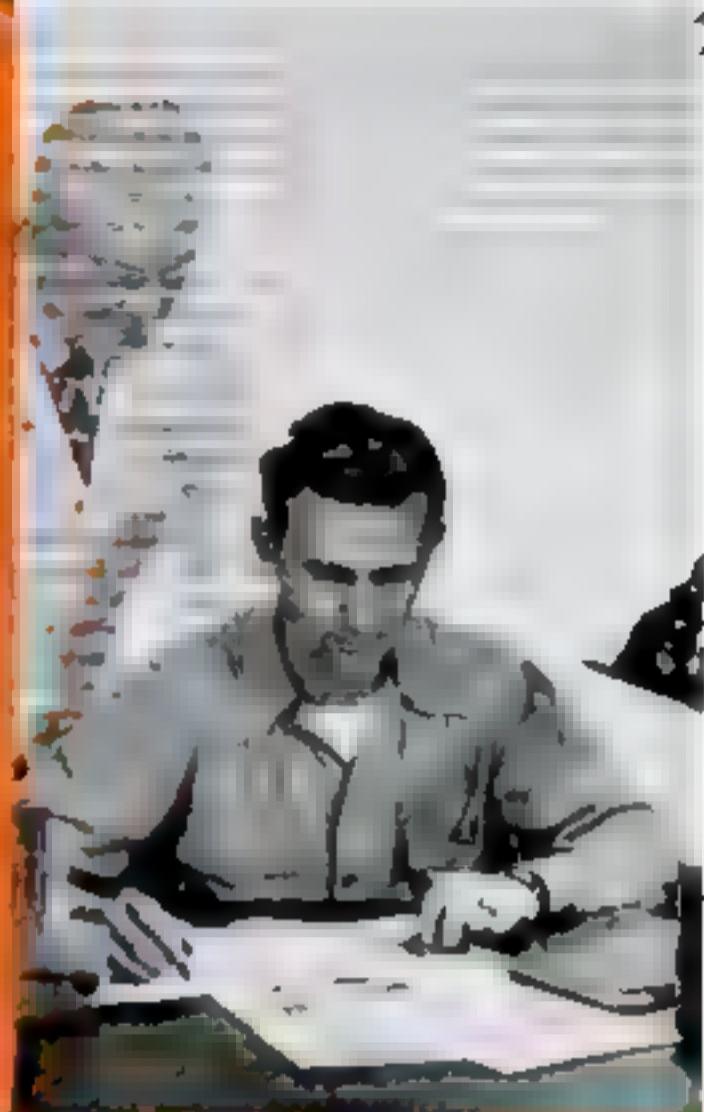
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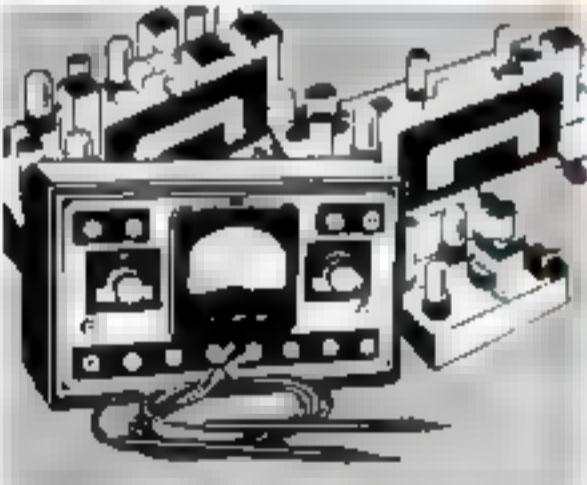


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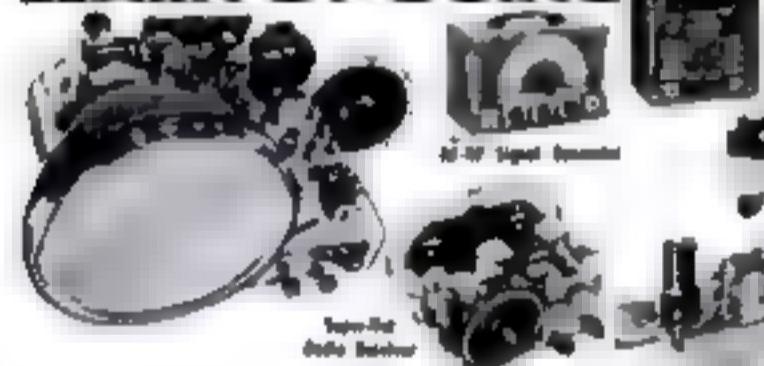


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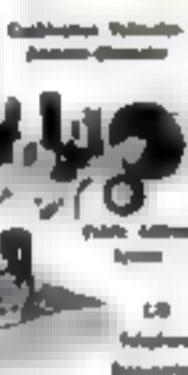
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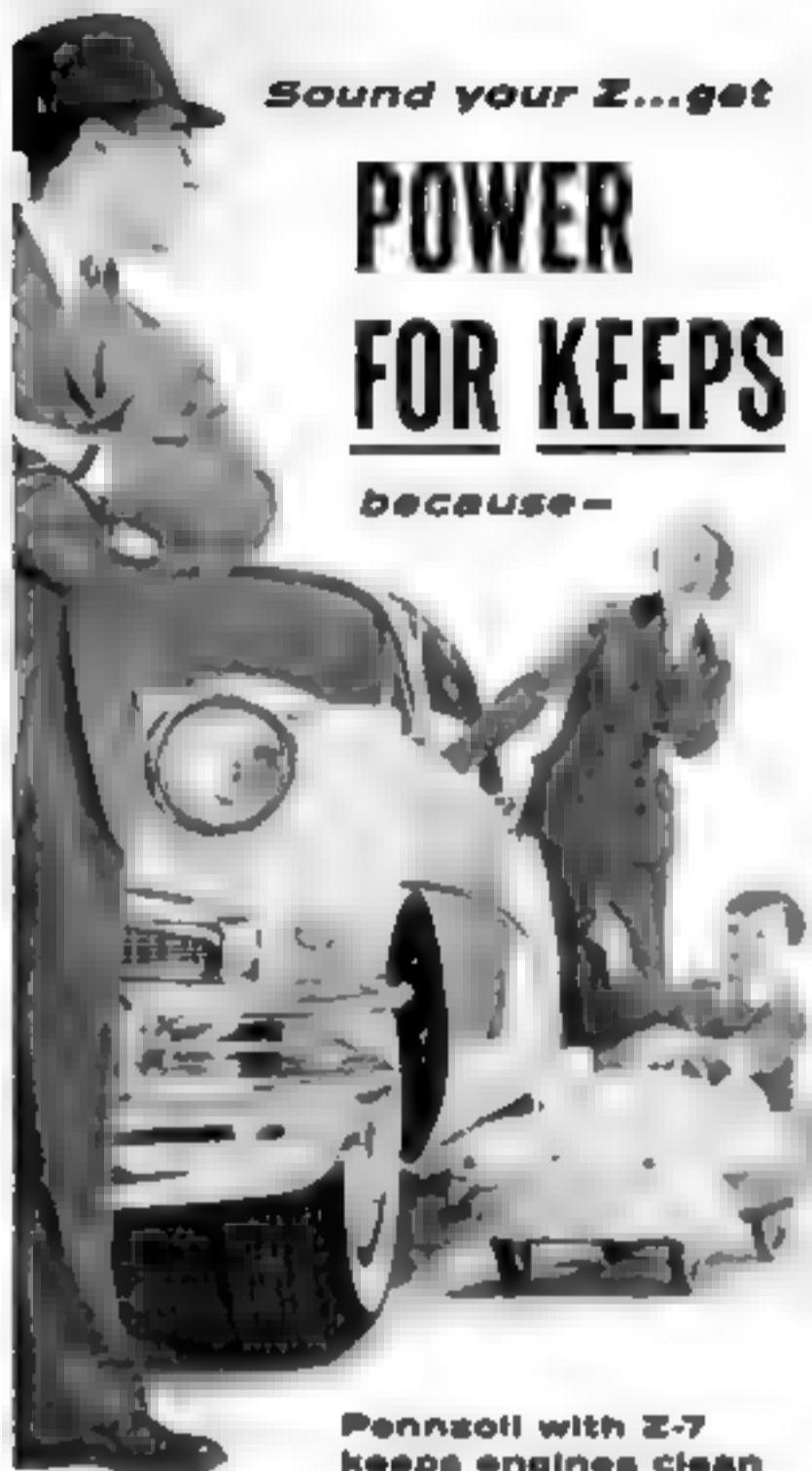
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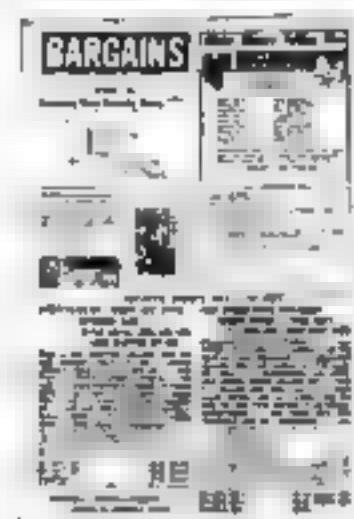
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- 25¢ Rudolph the Reindeer Brooches, 2¢ each
- Plastic Toy GUNS, 2¢ each
- \$1. Mufflers, Scarfs, 12½¢ each
- Double edge razor blades, \$1.50 per 1000
- LADIES APRONS, 4½¢ each
- \$2.50 Wallets, 30¢ each
- \$1. val. BIFOLDS, 15¢ each
- \$1. Kiddie handbags, 3¢ each
- CIGARETTE HOLDERS, 1¢ each
- BUTTONS, 14¢ for 25¢
- NEW Phone records, 78 & 45 r.p.m., 7¢ each
- 69¢ Insect Repellent, 5¢ each
- New 20" T.V. Pic. tubes, \$21.95 each
- Famous brand \$16.75 perfume, \$1. each
- 49¢ Xmas window decorations, 10¢ per set
- \$1-\$3 Hard cover books, 20¢ each
- \$200.00 Surplus typewriters, \$23.00 each
- 50¢ Everyday greeting cards, 7¢ per doz
- \$1.75 Men's Silk Ties, 12½¢ each
- \$1. val. personal cloth name tapes, 40¢ for 72
- 39¢ Under arm deodorant, 2¢ for 1
- \$1. Automatic card shufflers, 7¢ each
- NEW HAIRNETS, 7½¢ each
- \$15.00 Electric Percolators, \$5.00 each
- \$1.75 Rudolph Reindeer kiddie trolley sets, 35¢ each
- \$3.50 Lucite Hairbrushes, 65¢ each
- New Bobby Pins, 70¢ per 700 pins
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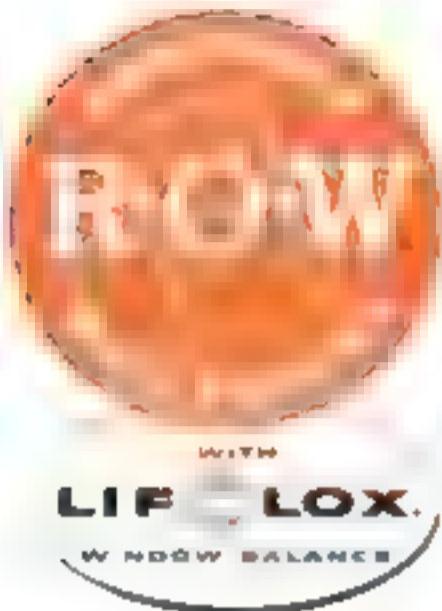
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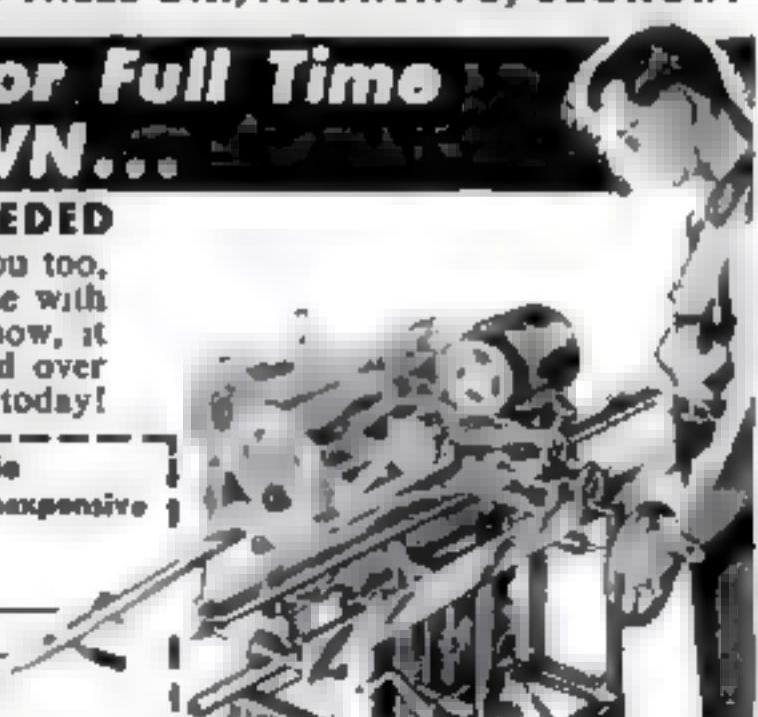
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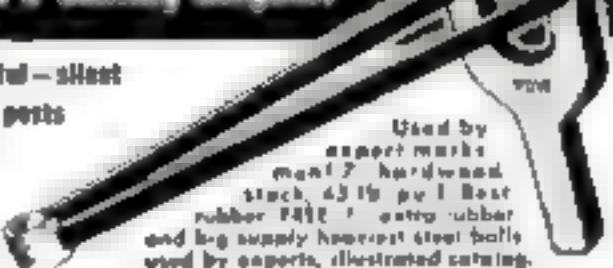
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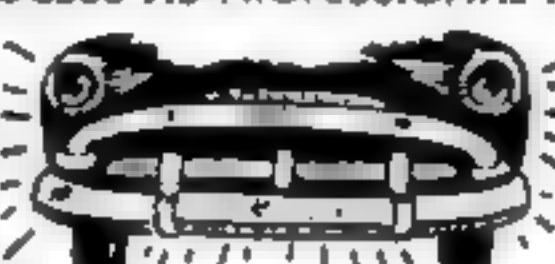


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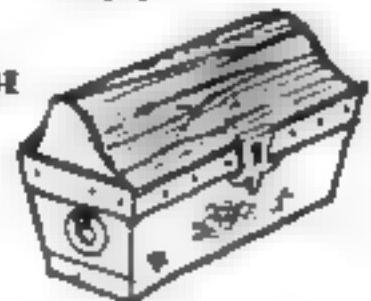
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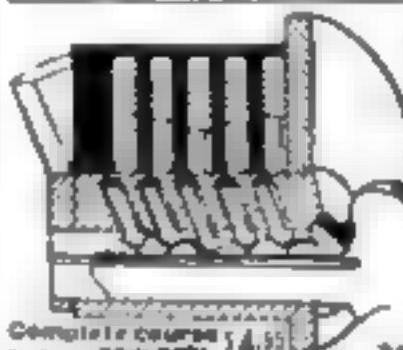
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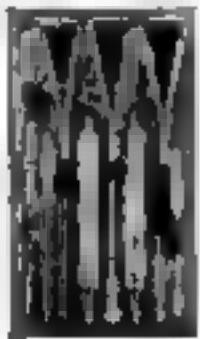
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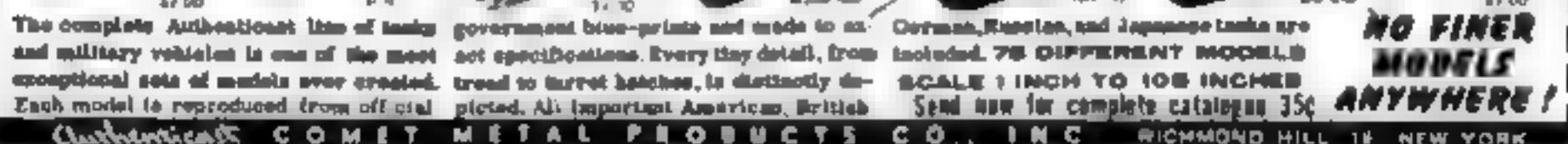
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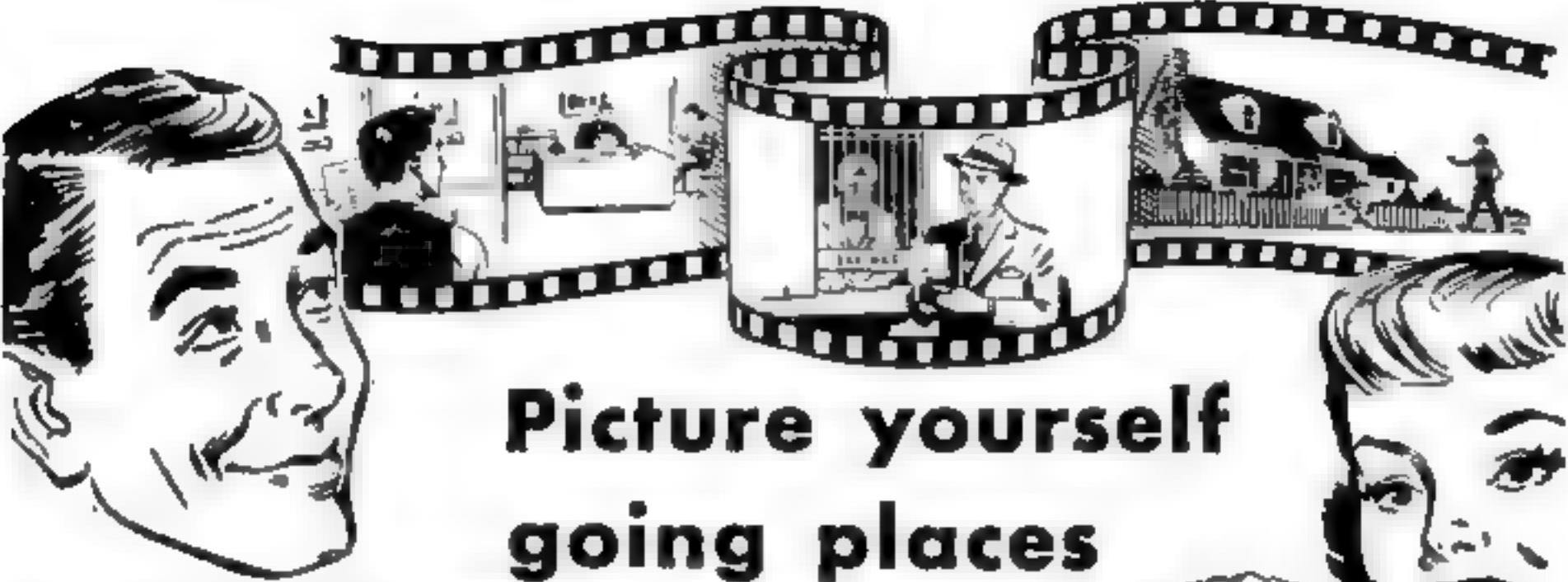
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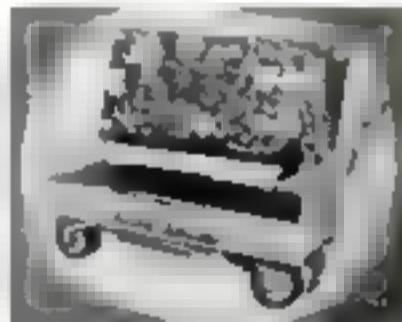
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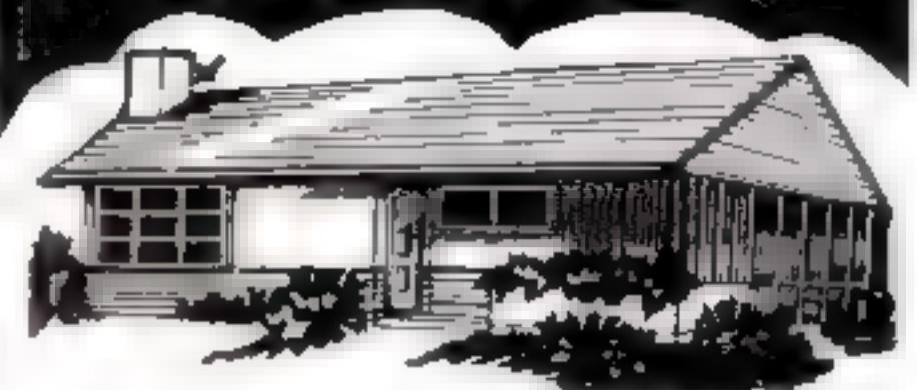
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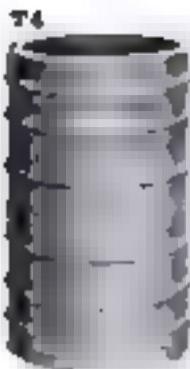
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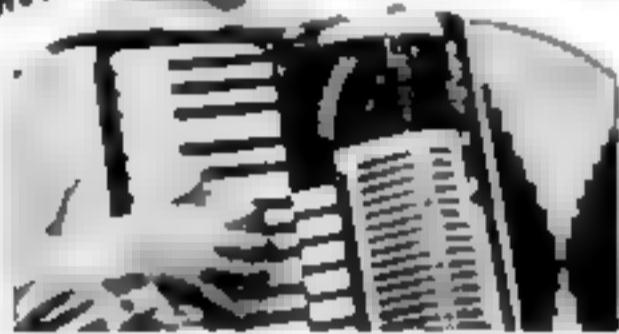
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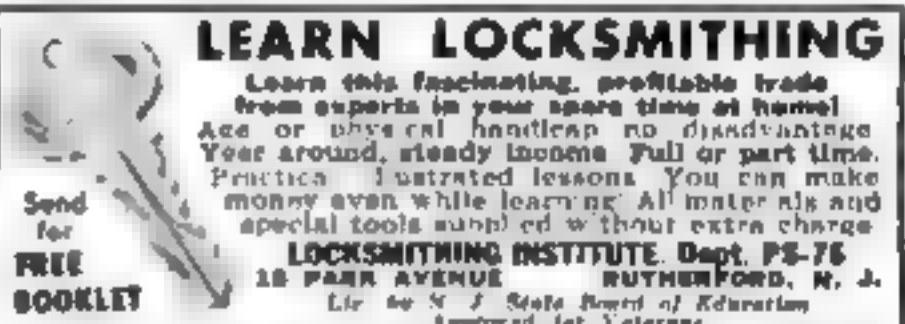
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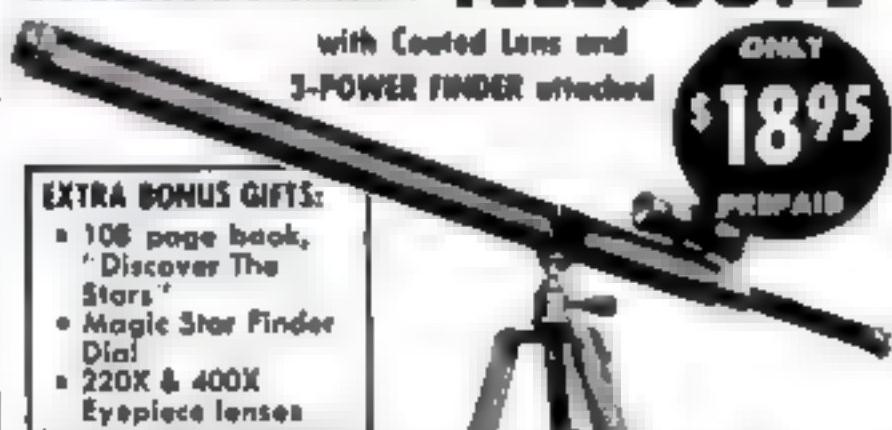
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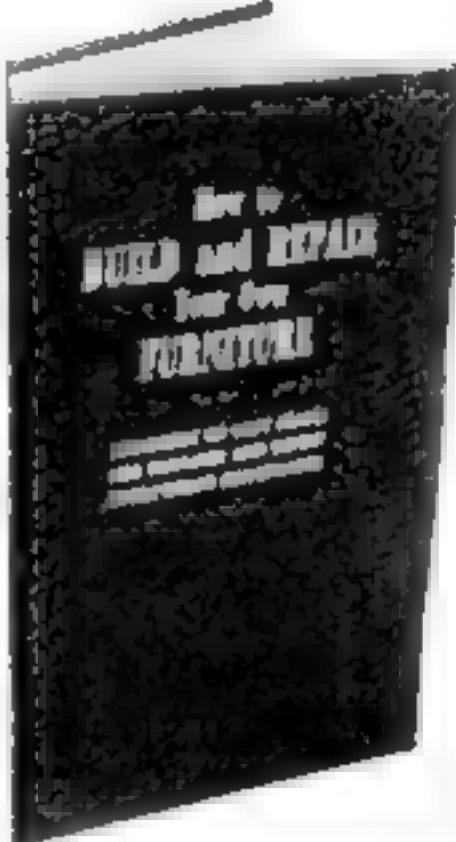
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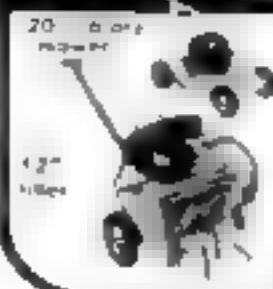
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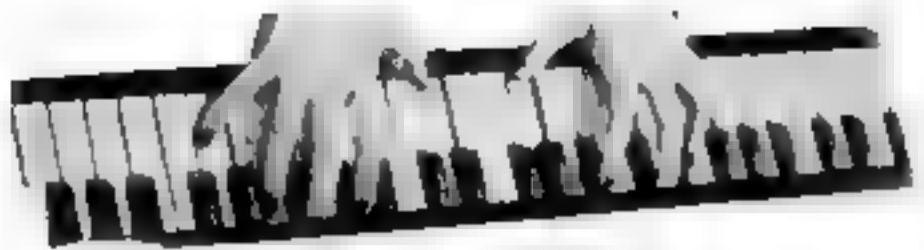
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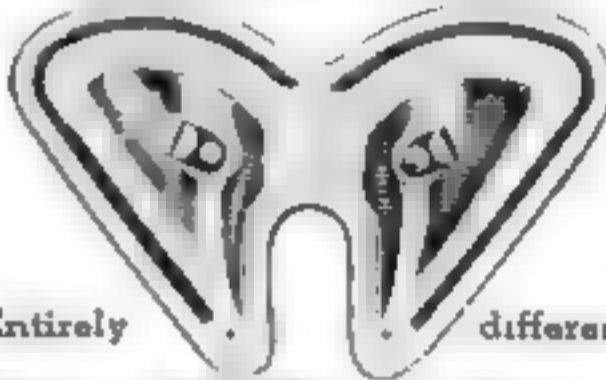
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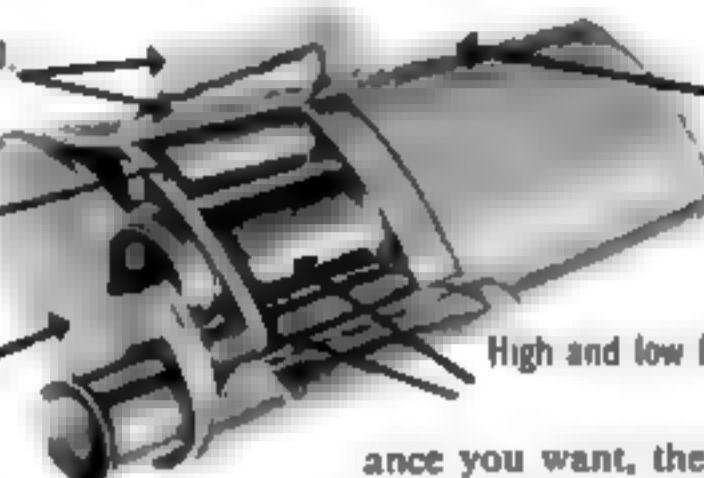
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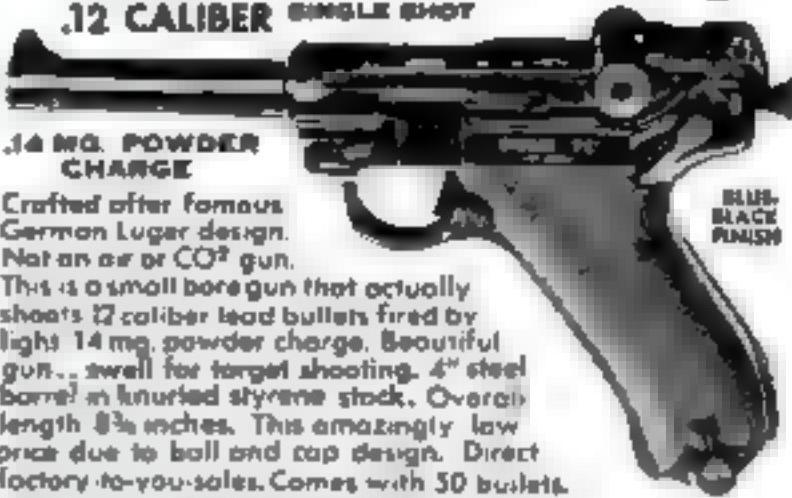
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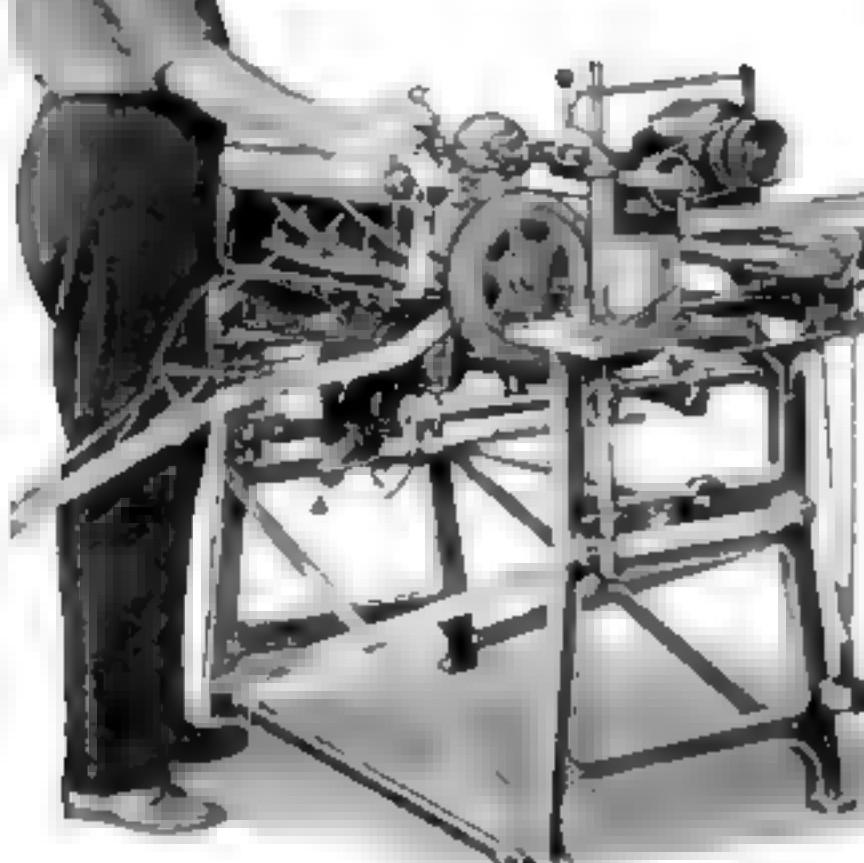
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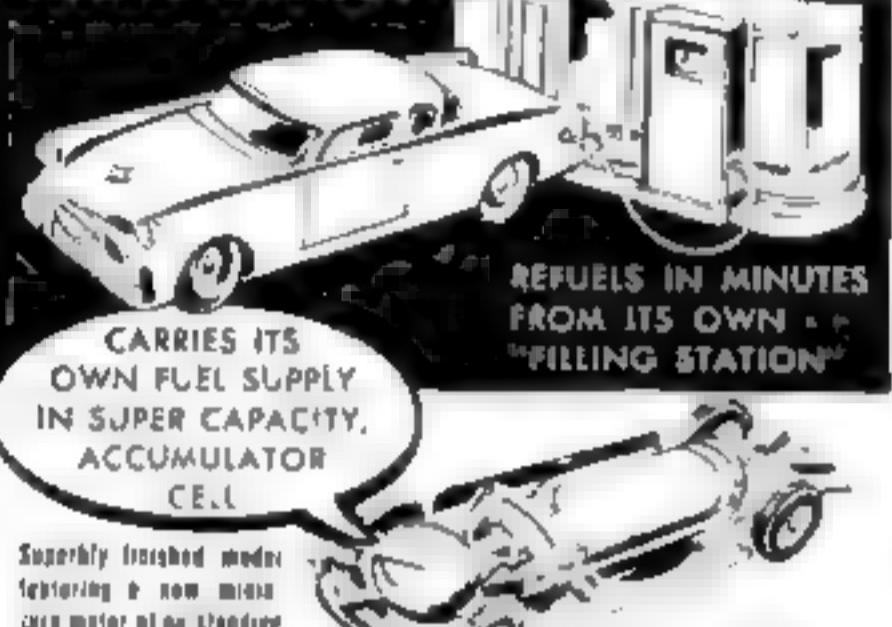
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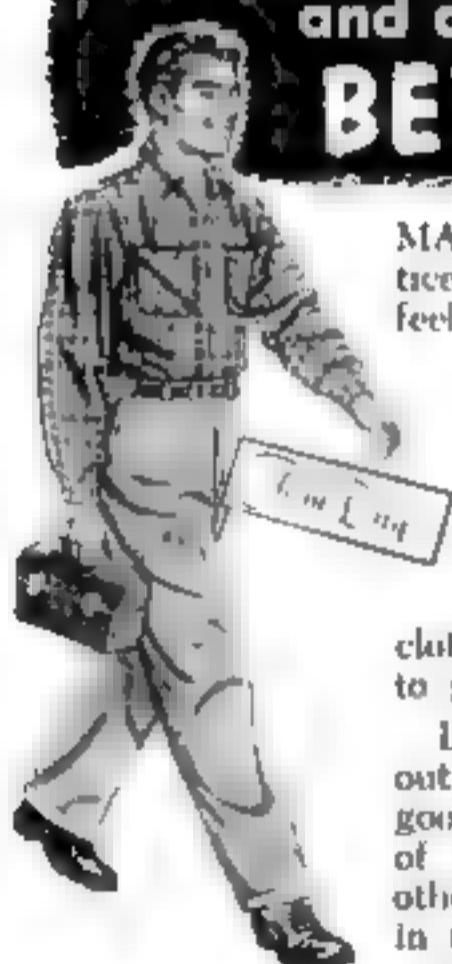
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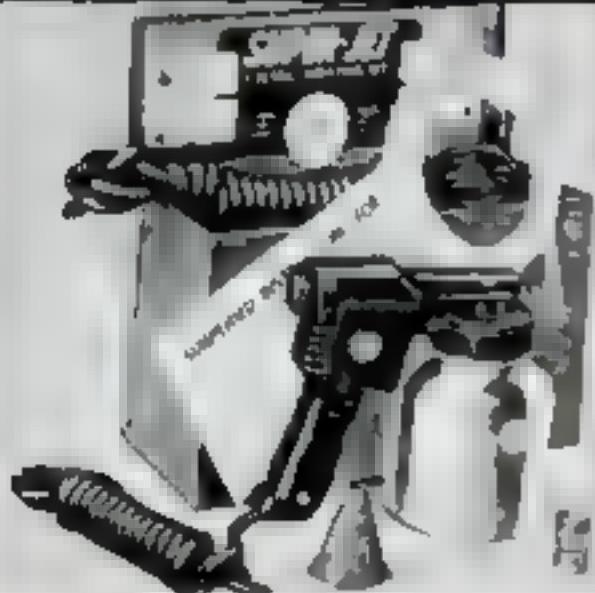
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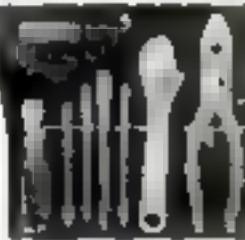


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MAKE Spare Time Money preparing and mailing sales literature. Adams Surveyor, 333 3 AB Sunset Blvd., Los Angeles 26, California.

SCHOOL Seniors—Sell Classmates America's Most Beautiful Graduate on Name Cards. Largest selection. Highest commission. Outsell all others. Free sample kit. Printcraft, Dept. P, 1400 Maple Street, Scranton 6, Pennsylvania.

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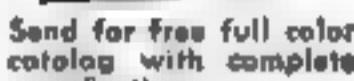
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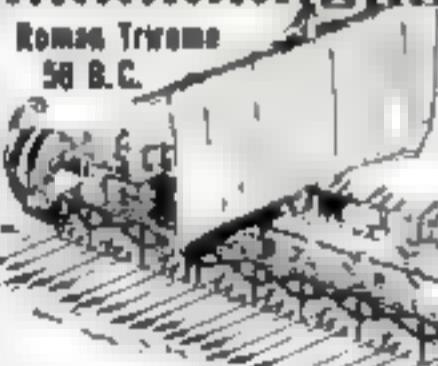


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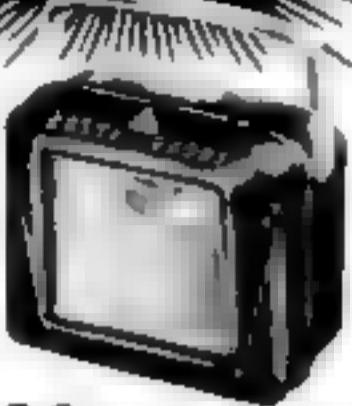


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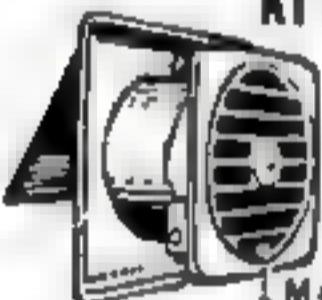
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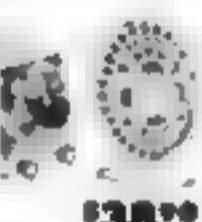
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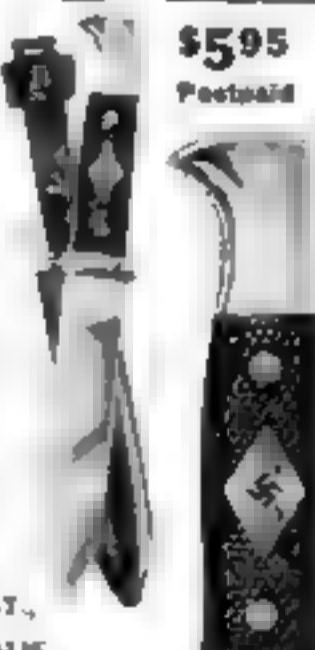
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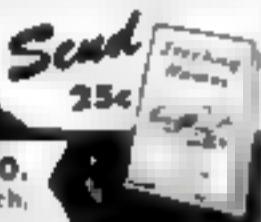
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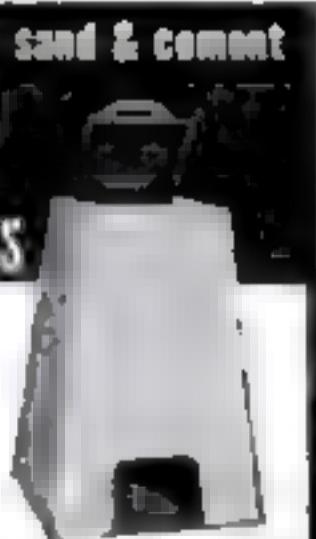
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see them
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COLORED WALLPAPER SLIDES, instead of catalogues, to help you choose paper. Projected on a wall, they'd give you a preview of a decorating job.—*Dick Fullerton, Oshkosh, Wis.*



A DRIVER-OPERATED SIGN on trucks and trailers to signal cars behind when it's safe to pass. Buzzing in the cab would remind the driver to turn it off.—*Stan Paskell, Keyser, W. Va.*



A BREADBOX WITH SCREENING forming a floor above a removable tray or drawer. You'd just pull out the bottom to clean or de-crumb the box.—*Phoebe M. Best, Lexington, Ky.*



A NAIL AND TACK HOLDER for workmen. A magnet fixed to an elastic to slip over the hand, or to a buckle-on strap for the wrist, would do the trick.—*Wm. Stettler, Wingate, Ind.*



A POSTAGE-STAMP DISPENSER holding a roll of stamps with pressure-type adhesive. You'd never have to lick them and they'd never stick together.—*Karl L. Martin, Cleveland.*

Everyone has his own pet idea of a gadget that he would like to see in general use. The five ideas illustrated above were suggested by *POPULAR SCIENCE MONTHLY* readers. What

is yours? We will pay \$5 for each one published. Please use Government postcards only. Write name and address clearly. Contributions cannot be acknowledged or returned.

For your Ford—always specify the muffler with the

TWIN SKINS!



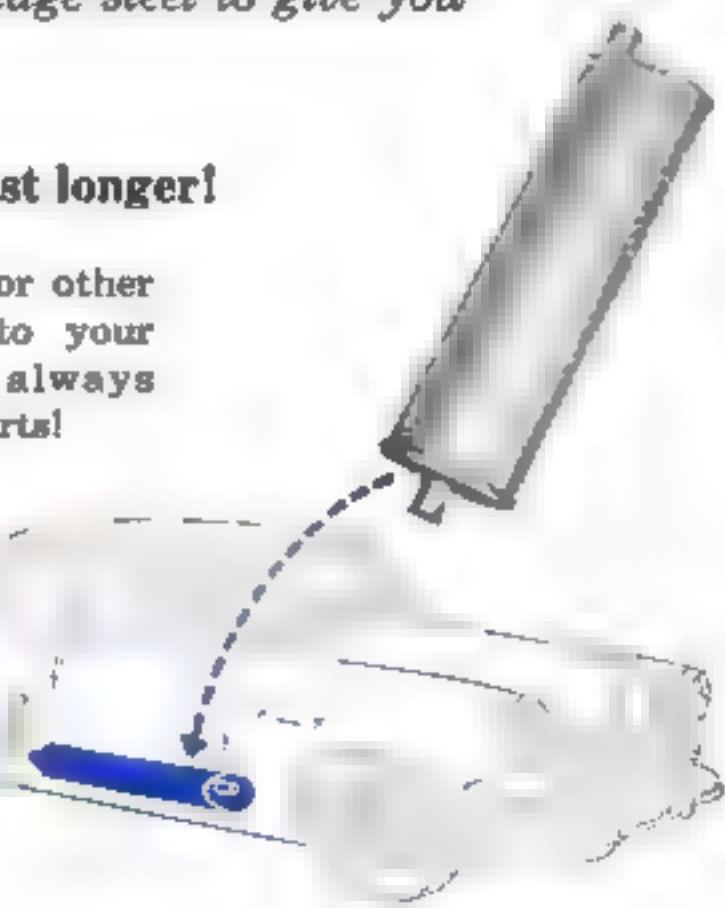
Peter de Paolo, former Indianapolis Speedway winner and now president of his own engineering research firm, recommends Genuine Ford Parts—the parts that are made *right* for your Ford.

"It's just good sense to insist on *Genuine Ford Mufflers!*" says Peter de Paolo. "They're double-wrapped with two layers of 26-gauge steel to give you greater quiet and longer muffler life."

Genuine Ford Parts are made right to fit right to last longer!

You know you're doing right by your Ford when you tell your serviceman you want *Genuine Ford Parts*. Every one is made to the exact specifications set by the men who first built your Ford. All *Genuine Ford Parts* must pass rigorous and exacting tests before being approved for manufacture.

When a new muffler or other replacement will add to your Ford's performance, always specify *Genuine Ford Parts*!



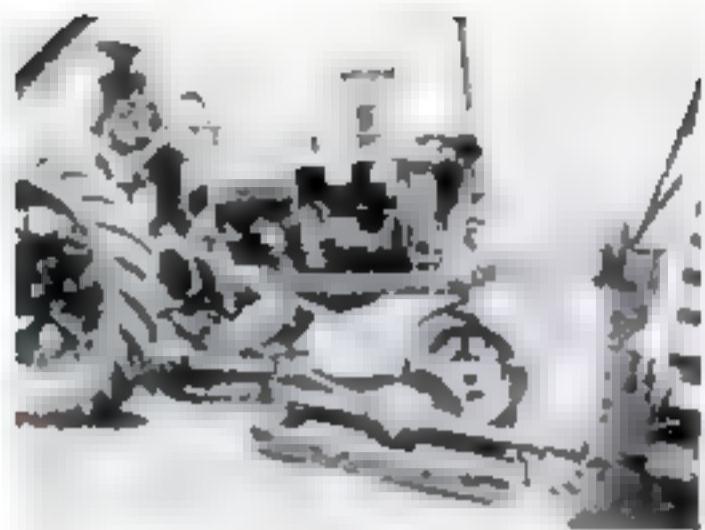
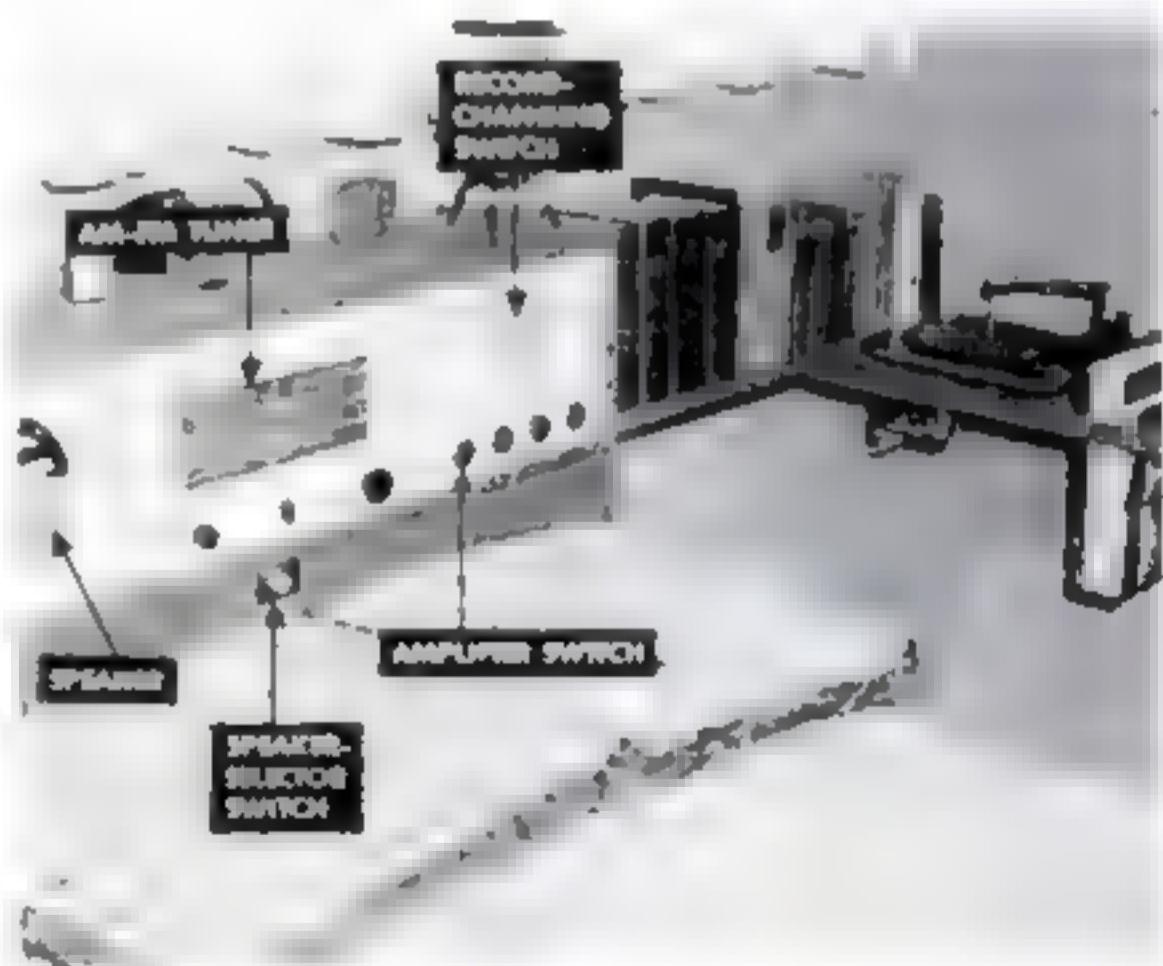
Keep your Ford all Ford

Craftsmen At Work



Bedside Hi-Fi Control.

With a headboard wired for sound, Donald Goldfarb of Beverly Hills, Calif., operates an elaborate hi-fi setup in his room without hopping off the bed. He flips one switch to connect an AM-FM tuner or an automatic record player to the amplifier. Another switch changes or rejects records. And sound can be switched to one or all of three speakers. For full-blast hi-fi there are 8" and 15" speakers. An 8" headboard unit provides quieter listening.



Auto Axle Right-Angles Power. To run a farm elevator where his tractor cannot be parallel to it, Kenneth Ornduff of Ainsworth, Iowa, runs the take-off belt to the shortened drive shaft of an auto rear-end assembly. Both axle ends are squared, so that power can be taken off either through a slip clutch, the other being locked to produce torque.

Bike Gets Two Front Wheels. Neighbors of C. A. Cole in Graham, Ala., learn to ride without spills on his special three-wheeler. He bent the stems of two old bike forks to right angles, bolted them to one another and then to the main stem of the bike. Spaced 20" apart, the two front wheels are said to steer just about as easily as one.

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name. Bonds wood to wood, wood to cloth, cloth to paper, upholstery fabrics to wood, and many, many other combinations! Let this Wizard with Wood speed things up around your workshop!

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**It's a real shop tool.
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Many hobbyists have been wondering how professional painters get those beautiful natural wood finishes. The magic word is Satinlac! Satinlac gives a handsome, satiny effect which wears well and is easy to maintain. Dries so quickly it's ready for the next coat in just 3 or 4 hours. In a jiffy you have a "custom-finished" job!



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**Blond Finish
on Furniture?
Use White Firzite!**

Now you can give furniture a blond woodsy finish without a "painty" or artificial look! Finish it yourself with White Firzite. This Wizard with Wood is equally wonderful for getting an eye-catching pickled finish. For tinted effects add colors-in-oil. (On soft wood or fir plywood paint jobs, White Firzite as an undercoater helps prevent grain raise and checking.)



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LATE NEWS . . .

Auto paints that need no waxing are being used on a few '56 cars. Du Pont contends that its two new finishes, Lucite and Dulux 100, hold color and gloss so well that simple washing will restore a new car's luster, at least during the first 18 months. Future Lucite lacquer may contain metallic pigments that will make a car's color appear to change as it goes by.

A new system of marking lumber grades is now being used by West Coast lumbermen. The old No. 1 has become Construction, No. 2 is Standard, No. 3 is Utility and No. 4 is Economy. The grades themselves have not been changed much, just the names. The switch-over was made to help do-it-yourselfers get what they need (neophytes often insisted on costly No. 1 when No. 3 was good enough). Grade marks for finish lumber stay as they were.

Atomic airplanes came a big step closer to reality with the first flight of a nuclear reactor, in a B-36 bomber. The reactor operated in the air, but it did not power the plane.

Research on MS—the fatal muscular dystrophy—achieved a major breakthrough with the discovery of MS-afflicted mice by Ann Michelson, a Smith College undergraduate working at Jackson Laboratory. These staggering mice are the first animals found for testing MS treatments.

Cars Last Longer Now



A four-cycle outboard—a hefty four-cylinder job that turns out 35 hp.—eliminates the chore of mixing gas and oil, which two-cycle engines require. An electric starter is standard on the new Fageol 44. (For more news of boats and engines, see p. 89.)

Orphan viruses have been found by scientists studying polio. The orphans are like other disease-causing viruses, but they cannot be linked with any known disease.

The Perhapsatron, first machine that Los Alamos scientists built to study fusion power, may show how to tame the H-bomb. It was designed for research on the Pinch Effect, the magnetically caused contraction of a current-carrying stream of gas. This reduces the stream to a narrow thread that does not touch the container walls. The Pinch Effect might permit the gas stream to be heated to the tremendous fusion temperatures without melting the container.

Air turbines will power all accessories on the B-52. Air from the jet engines will spin turbines driving hydraulic pumps or electric generators. The turbines, made by General Electric, can be installed anywhere on the plane.

Seven of anything is the maximum load the brain can handle easily, Prof. George A. Miller of Harvard has found. Men have difficulty remembering more than seven items, or judging more than seven degrees of magnitude.

Good book. The conquest of the doorway to space is detailed in *200 Miles Up* (Ronald Press, \$5) by J. Gordon Vaeth of the Navy. It covers, in simple text and good pictures, upper-air exploration from its beginnings in 1946 to the plans for artificial satellites.



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To get the most from today's modern combination of high-compression engine and high-octane fuel — you'll want new *balanced heat* AC Spark Plugs installed in your car every 10,000 miles. Why not see your nearby AC dealer soon?

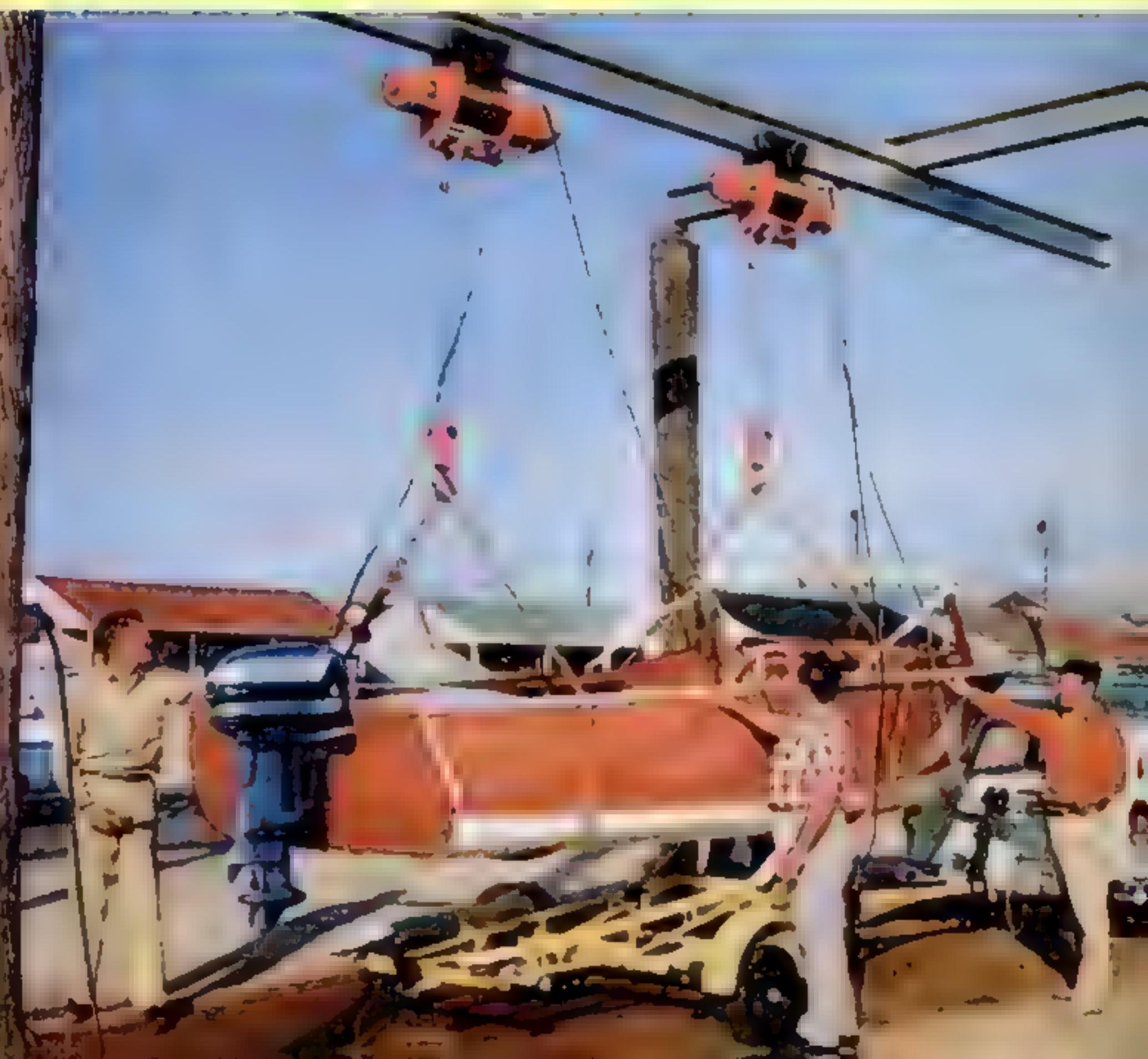


AC SPARK PLUG THE ELECTRONICS DIVISION of GENERAL MOTORS
96 POPULAR SCIENCE



Spring boat fair

Suddenly, everybody's going outboarding—or dreaming of it. This year about five million outboard motors will propel more than 25 million Americans over fresh or salt water on some kind of boating sport. A key to the outboard's skyrocketing popularity is its versatility: You can race at alarming velocity on a bouncy little shingle, or put-put in wily pursuit of the small-mouthed bass; you can take the family on a hot-dog picnic, or make a week's trip on a comfortable cruiser. On the next 23 pages you will find a series of special articles on how to get the most fun out of this kind of boating.



Matching the motor to your boat

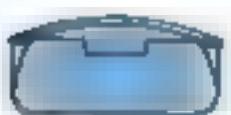
SELECTING the right motor for an outboard hull is a problem that is stumbled surprisingly often—as inspection of many a public mooring will show. The typical difficulty isn't with underpowering, which is obvious, as much as with overpowering, which isn't.

Clamping too big a motor on the transom is not only dangerous at times but it's also a little dumb: The motor costs more to buy and more to feed, and it never pays off in proportional speed increase. The captions and diagrams at the right list the hull-and-motor combinations that are recommended by exper-

Boats belong to two main families



DISPLACEMENT HULL has a curved bottom. Broad amidships, it narrows at stern.

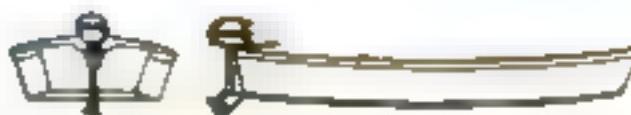


PLANING HULL has a straight bottom that always becomes broad and flat at the stern.

enced boatmen, and by the makers of both motors and hulls.

Which hull? The first step is to determine which of the two basic hull types you have—displacement or planing. While a few hulls fall into a kind of no man's land between, most are easy to identify as one or the other.

A displacement hull is shaped to go through the water, and it is typically broadest near the middle, narrowing at



SMALL ROWBOAT, the fisherman's favorite, is a 12- or 14-foot displacement boat.

Horserpower	Speed	Miles per gal.
1.7	8	30
3	7	15
5	8	12
7½	8	8



DINGHY OR PRAM is usually eight to 10 feet long. (A dinghy typically has a pointed bow, a pram a square-ended one.) These are displacement hulls, with round or V bottoms. Small motors are desirable.

Horserpower	Speed	Miles per gal.
1.7	4	25
3	6	12





LARGE ROWBOAT may be 15 to 18 feet long, may have a flat, round, or V-bottom displacement hull. Though big and heavy, it does not want to be overpowered.

Horsepower	Speed	Miles per gal.
3	6	13
5	7	12
7½	9	10



LIGHT UTILITY RUNABOUT has a planing hull 11 to 14 feet long, needs five hp. minimum.

Horsepower	Speed	Miles per gal.
5	10	20
7½	15	16
10	20	18
15	23	13
25	30	10



SQUARE-ENDED CANOE with aluminum or fabric skin is primarily a displacement boat, although it can be planed with high power.

Horsepower	Speed	Miles per gal.
1.7	6	14
3	8	14
5	12	15
7½	17	17



LARGER RUNABOUT, 13 to 18 feet long, may require 10-hp. motor to begin planing, even with only one person aboard.

Horsepower	Speed	Miles per gal.
10	20	18
15	22	12
25	28	10
30	32	9





the stern. The after part of the hull also usually curves upward a little. Examples are rowboats, canoes, dinghies, kayaks and sailboats.

A planing hull is designed to ride the surface, and characteristically has a broad, flat bottom at the stern. Examples include modern outboard cruisers, hydroplanes and high-performance runabouts. Do not judge by whether a boat has a round, flat, or V bottom in the midships area; the identifying characteristic of a planing hull is a broad, flat bottom from the midsection back.

Traits. The two hulls vary greatly in power requirements. A displacement boat has excellent load-carrying capacity, but it is not designed for high speeds. It has a natural "critical" speed beyond which it cannot be pushed except by big increases in power.

An overpowered displacement hull tends to squat at the stern, drag a large bow wave behind, and behave crankily. The best motor for such a boat, generally speaking, is the smallest one that will bring it up to or near its critical speed. Adding more power beyond that will increase the top speed very little and may harm the handling.

A planing hull is different in that it has a definite minimum power requirement, which *varies with load*. It has to be pushed along fast enough to get into planing position, or else it will simply lean back and wallow along. The best motor for such a hull is one that will bring the boat into planing position with the average number of passengers it will carry. This may cover a considerable range: A small runabout may need only five or $7\frac{1}{2}$ hp. to plane with one aboard, but if it is loaded with four people and miscellaneous accessories, it may need 12 to 18 hp.

Certain displacement hulls, notably flat-bottomed skiffs and canoes, can be planed by using lots of power with light loading forward. This doesn't mean that it's wise to do it; the dangers of overstrained transoms, uncertain and skiddy turns, and general instability advise against trying it.—Bob Whittier.



OUTBOARD CRUISER usually has a planing hull, is often 18 to 21 feet long. The figures apply to single-motor rigs.

Horsepower	Speed	Miles per gal.
15	15	10
25	20	8
30	24	7



UTILITY HYDROPLANE or racer carries two people over a wide speed range:

Horsepower	Speed	Miles per gal.
7½	20	18
10	25	24
15	30	13
25	35	10
30	40	10





1 See-through sails give a small-boat skipper safer vision when shaving a buoy in a tight race. Made of Mylar, a flexible plastic only a few thousandths of an inch thick, the experimental new sails are strong, light, and so smooth as to reduce the amount of air drag considerably.



New on water



2 Pontoon put-put carries two comfortably on a tilted seat, and draws scarcely more water than a canoe. The "Water-Skeeter" also comes in a pedal-powered version with a chain-driven paddle wheel. The two nine foot pontoons are fiberglass.

3 Fog-bound yachtsmen can now emit 115-decibel blasts with the portable foghorn at right. It can be easily heard for more than a mile. Powered by Freon gas, the instrument will give 450 two-second blasts per charge.

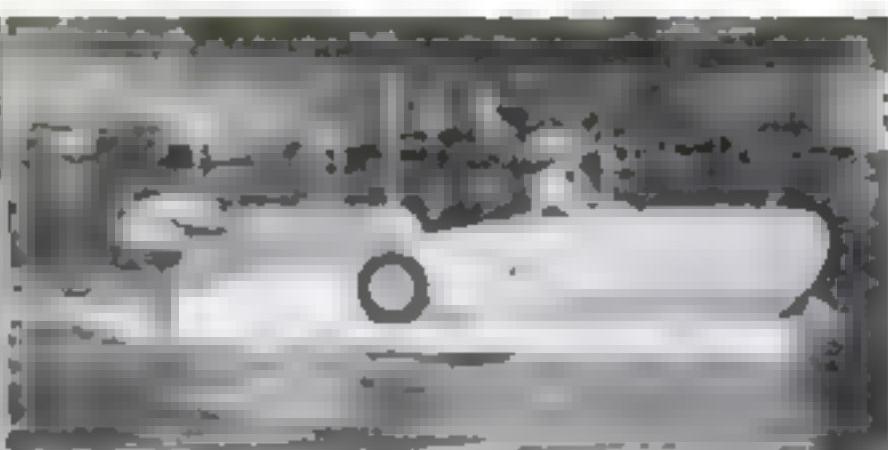
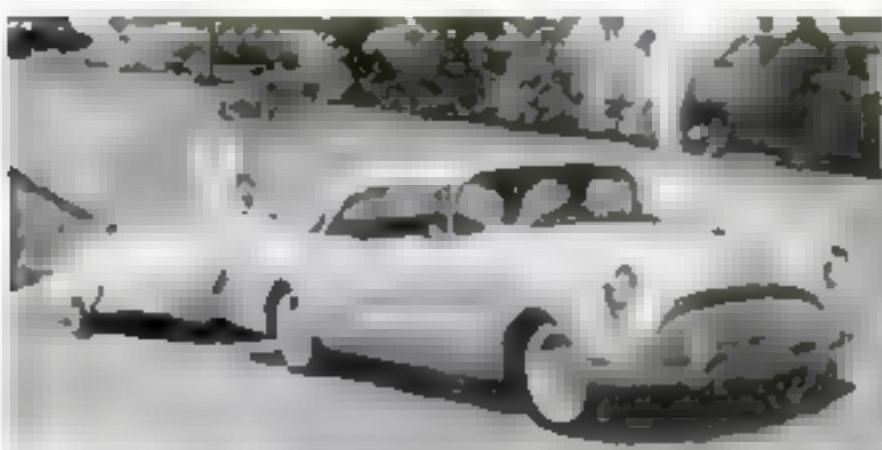


4 Snags and shallows hold no terrors for air-driven boats, which when planing can run on as little as one inch of water. Models ranging from 190-hp., 55-m.p.h. speedboats to little two-hp. clamp-on outboard motors are available. The latter job weighs 39 lb.





5 A floating trailer, this British-made amphibian slides off its steel chassis into the water when locking pins are removed. Pulled back on the chassis by a winch, it's a trailer again. It sleeps three, is driven by a small outboard, and weighs 1,288 lb. It is 14' 2" long, 6' 8" wide, and 8' high.



6 A trawling boat built by Howard K. Dearborn trundles smoothly along the road on two rubber tires. Arriving at water, you simply pull a lever to retract

the road gear. Afloat, the boat rides on a pair of 30" pontoons 12' long. The fiber-glass-covered plywood craft is capable of a fine turn of speed on water.



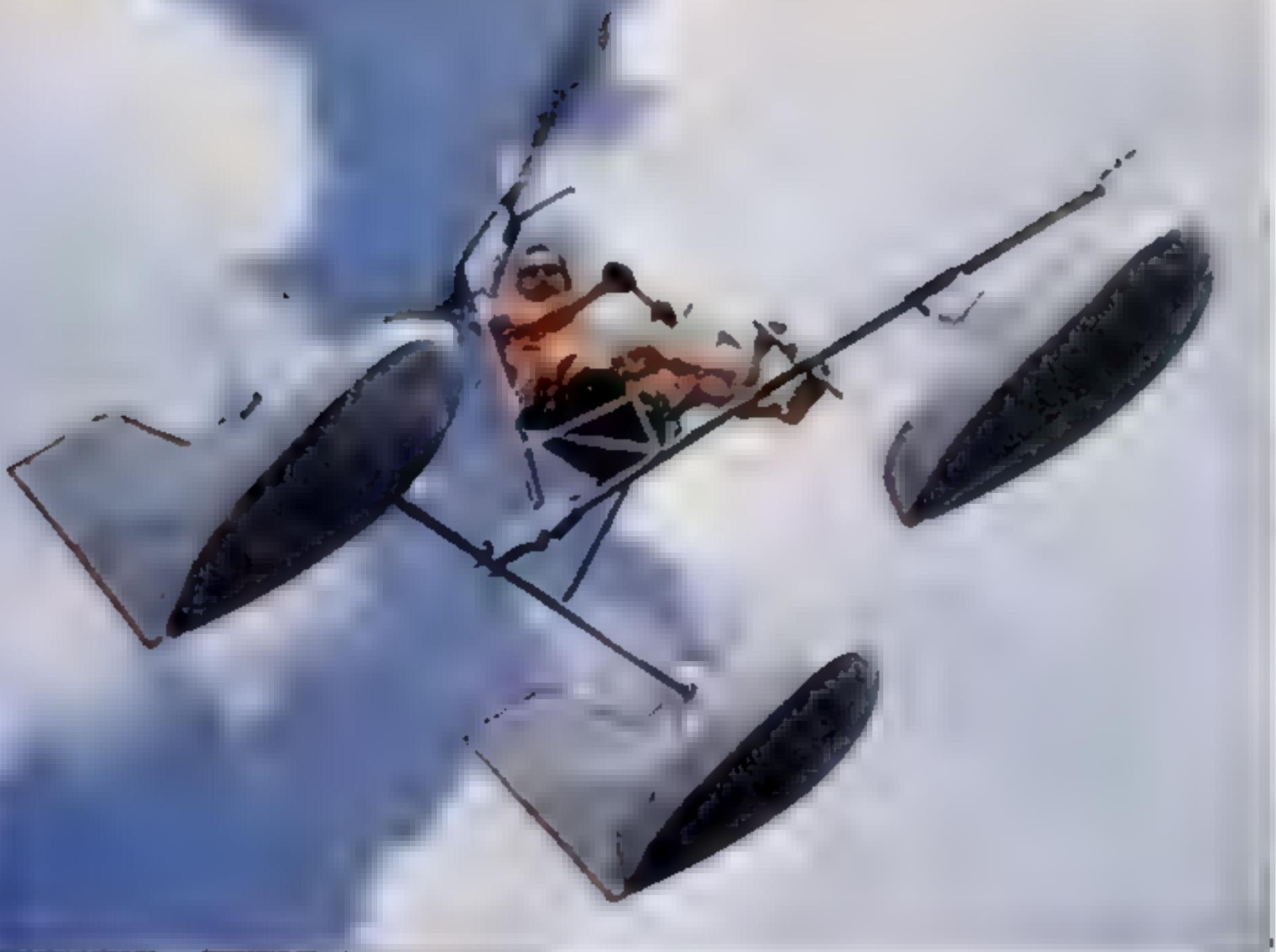
7 Floating boathouse uses an ingenious wrinkle: the weight of the hinged metal roof helps lift the boat up out of water. The boat is docked between the two rows of welded drums, and lifting cables are snapped on the bow and stern. Then the roof is lowered, hoisting up the hull inside.

8 For moist fun, the 85-pound "Water Skimmer" is tough to beat. Its Styrofoam-filled plywood pontoons supply flotation, and holes in the transom let out the water it ships. A 16-hp. motor sends it skipping along at 40 m.p.h. It costs about \$120 without the motor and controls.



Further information on these products can be obtained from:
L. Abbott R. Pierce Jr., Deacon Road, Marion, Mass., 2 Dallas Engineers, Inc., Dallas, Pa.; J. Falcon Alarm Co., Inc., Summit, N.J.; G. Airboats, Inc., 6412 Hampton Ave., St.

Louis 9; S. Amphibian Ltd., Conduit Lane, Huddersfield, Huddersfield, England; 6. TrawlerBoat c/o Howard K. Dearborn, Berea, O.; 7. Northway Georgia Enterprises, Rome, Ga.; 8. Stillwater Lumber & Woodworking Co., Stillwater, Minn.



SPRING BOAT FAIR



You can even fly behind an outboard

TOWED behind an outboard runabout, this contraption combines water skiing and flying thrills.

The first public demonstration of the new rotary-wing kite took place recently at Florida's Cypress Gardens. With a surface breeze helping, it became airborne at a wind speed of about 25 miles an hour. A speed of 30 is necessary for adequate control in maneuvering.

The Hydro-Glider, as its inventor, Igor Bensen, has named it, flies in the same way as the land-based version of his man-carrying whirlybird kite (PSM, July '54, p. 98). He merely attaches his tow rope to a boat instead of an auto-

mobile. The boat's speed turns a free-wheeling, two-bladed rotor. That creates the lift necessary for flight.

Flying over water eliminates the problem of finding a landing site; if the tow rope should break, the Hydro-Glider just coasts gently down.

Bensen says that learning to fly his whirlybird entails only a few hours of instruction. He "checked out" a novice in Florida for solo flight, in one instance, in three hours.

The machine costs close to \$1,000 complete at the factory in Raleigh, N. C., but it can be built from plans if the basic mechanical components are bought.

How to keep your

If a bent blade is cutting down your motor's performance, this simple jig will help set it right.

By Phil McCafferty

WHEN the blades of a boat propeller do not cut the water at exactly the same angle, or the angle is wrong, trouble aplenty will result. One bad blade of a small prop, bent so little that the eye can't detect it, can cut down top speed, increase fuel consumption, and cause exasperating vibration. It can happen easily, too. Grounding on a sandbank, nudging a log or rock, or careless beaching are common ways in which props get bent.

The curves of a prop blade may be subtle to the eye, but they are not hard to capture on a set of simple templates or gauges, made as shown below. The job takes no special equipment, and can be done in an evening, for little cost.



With the checking gauge set on its own circle,

Triple threat. There are three separate uses for these templates: (1) You make a set to match a new, accurately pitched prop and then put them aside for

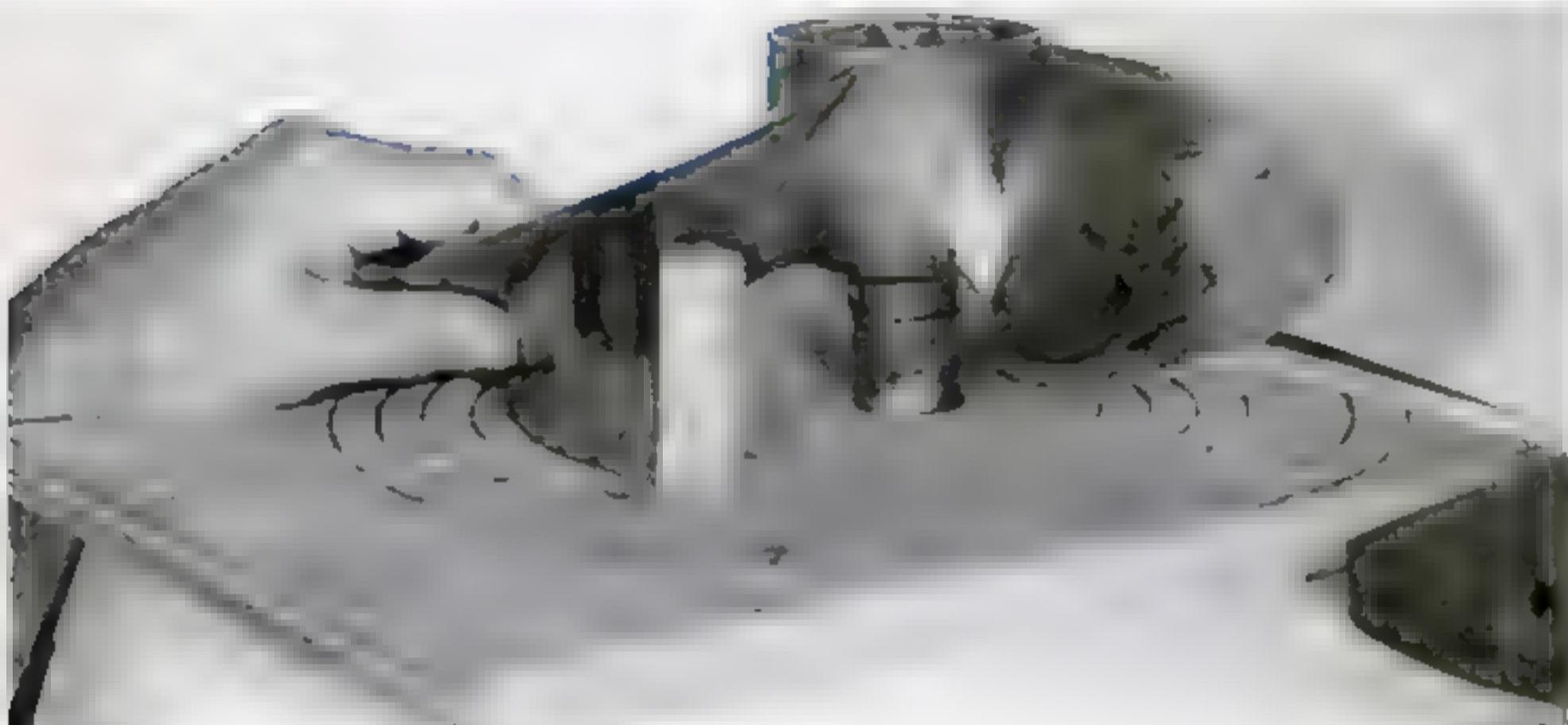


DRAW CIRCLES on a piece of $\frac{3}{4}$ " plywood. Diameters between 6" and 12" are most useful for outboard props. In the center, fit a perpendicular rod that can be sleeved to fit your props. Lay out on paper a series of right triangles. The base of each is the pitch of the prop in inches

(usually stamped on the hub or listed in the handbook). The altitude of each is π times the diameter at which the gauge is used. Snip out a piece of tin plate that duplicates the apex of each triangle. Then bandsaw blocks curved for each pitch diameter that you are gauging.



propeller shipshape



each prop blade is turned up against the curved edge. Any error in pitch is then apparent.

future use as a repair guide when a blade gets bunged up; (2) you make several sets in various standard pitches, and use them to identify the pitches of unmarked,

unknown props; (3) if you suspect that your motor-hull combination ought to go better, you make several sets of slightl

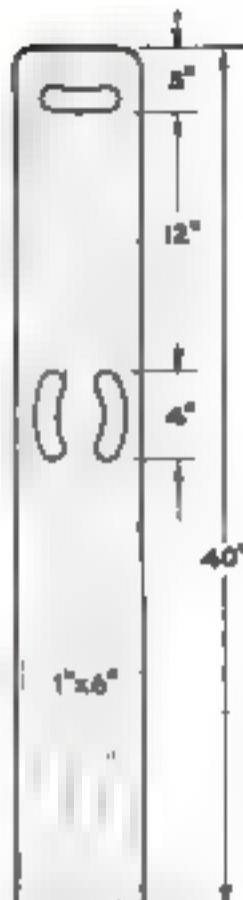
[Continued on page 268]



ONE SET of at least three or four gauges is desirable for each pitch to be tested. Nail each tin triangle to a base block curved for its diameter, smoothly bending the metal to match. Mark each gauge for pitch and diameter. In the typical set of gauges shown above, note



how the angle lessens as the checking diameter increases. In use, test each prop blade at each diameter. When you find an error, reshape the blade by cautious work with a soft-faced hammer, rechecking the pitch at frequent intervals. Do not bend a blade more than is necessary.



1 Regular paddles, so handy for docking and mooring, seem to get stepped on and broken with dismaying ease. But these homemade substitutes are tough, and even if one does break, another can be made in a few minutes. Use a pine one-by-six, and round off the edges of the handgrip holes.

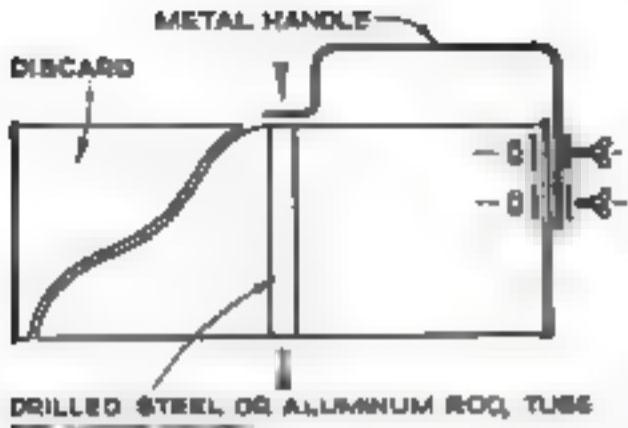
Seven hints for



3 A gallon of concrete, with a U bolt embedded in the wet mix, serves as a fine fishing anchor for a small boat. The black tape, wound at one-foot intervals on the anchor rope, gives you a simple indication of depth.



4 Hauling too hard on a boat-trailer tie-down may spring the hull; not hauling hard enough makes for uneasy trailing. The remedy: Cut and fit a batten to take the strain at the anchor point, and then snug it up tight.



2 For fast bailing, a rectangular scoop is good because it lets you dip the water up and out in one motion. A one-gallon antifreeze can, cut as above, forms the body. Fold in the raw edges and crimp them flat. Fit a center support of wood or nonrusting metal and attach a handle. If you keep the bailer painted, it'll last several seasons.



do-it-yourself sailors



5 Don't trust dogs on a trailer winch to stay engaged on a long haul over bumpy roads. A heavy rubber band cut from an old inner tube will lessen your fears that the boat may start cruising on land. The looped band also helps to eliminate some trailer rattles.

6 An alligator clip, obtainable in an electrical-supply store, is useful in any fisherman's tackle box. A one-ounce bell sinker attaches easily to the wire screw, the jaws clip quickly to the end of a leader. This gives a sounding line to measure depth when in murky water.



7 A bait bucket or fuel container can set up a terrific racket on the bottom of a metal-hull boat at certain engine speeds. Rather than trying to wedge it quiet, simply slip an old rubber sink mat under the offender. It not only hushes the clatter but keeps the can from creeping about. Auto floor mats or old nonskid mats from bathtubs or showers will also do the job well.

OUTBOARD New ideas

1 Motor Power to Tilt Props.

A motor coupled to this outboard-propeller mechanism would spin the blades, rotate them (for steering) or jack them out of the water to prevent fouling. To apply lifting power, the operator would throw a lever that would engage a worm and gear and uncouple the propeller drive. The worm design would limit the lift.

2 Pump-Up Boat to Sport a Motor. Until you put in the air, this inflatable fabric boat would take less car space than its motor. Doubled on themselves at the rear, the pontoons would support a rigid mounting board to spread motor weight over a large area.

3 Weed Cutter to Free Props. Clamped to any outboard, the blades of this cutting attachment would ride ahead of the props. They'd slice through weeds to prevent fouling of the shaft. The rudder-like blades, says this inventor, would also improve steering.

U.S. patents on these inventions have been granted to: 1. Peter K. Dewhurst, London
2. Fred G. Dill, Portland, Oregon
3. Harry F. Coughlin, St. Louis, Missouri
4. and Helen P. Potts, Bridgton, Maine
5. Grover D. Johnson, Baldwinville, N.Y.
Cochran

from the inventors

SPRING BOAT FAIR

4 Surfboard to Pull Itself. With a motor mounted in the well of this surfboard, a water jockey would have no need for a tow boat. Deflecting baffles around the motor would prevent water from splashing up through the well opening. A downward slope of the hull behind the rider would lift the back of the board at high speeds to keep it level and high on the water.

5 Hydraulic System to Steer Outboard. Instead of a clutter of drums and cables, the boat below would use thin tubes to link motor and steering wheel. The piston of one hydraulic cylinder would be sprocketed to the wheel. Fluid pressure, transmitted to a second cylinder, would turn or tilt a motor mount.

6 Jets to Boost Prop Power. Standard screw propellers waste a lot of energy agitating water instead of pushing a boat, so this inventor would enclose turbine-like vanes in a special housing. Water flowing in at low pressure would be thrust out at high velocity. Such jets, he says, convert more power into push.



AN OLD HAND WITH HYDROS, Rogers says that this one likes motors in the 8-to-10-hp. range. His advice to novices: Get in some time at part throttle until you get the feel of the thing, avoid rough water or large wakes from other boats.

By John Rogers

FOR pure unadulterated thrill, it's hard to beat blasting along in a racing hydroplane. The sensation of speed is terrific, and there are constant opportunities for testing your skill and your nerve.

The speedy cockleshell shown here and on the cover has four big virtues:

- It can be built in a couple of weeks of spare-time work by anyone who can pilot a screwdriver and saw. There is no tricky table of offsets, no need for full-

size plans, and no steam-box wrassle with the curves.

- It's cheap. I spent about \$60 for paint, screws and lumber (specifying first-grade mahogany), and I didn't use any workshop scrap. If your shop has the normal accumulation of odds and ends, you might cut the cost of the hull by a third. The wheel, throttle, fin and fittings may tack about \$25 to the bill.
- Designed for 10-hp. motors, it doesn't need big, expensive power plants. Even with a little 6-hp. rowboat kicker (about

[Text continued on page 118]

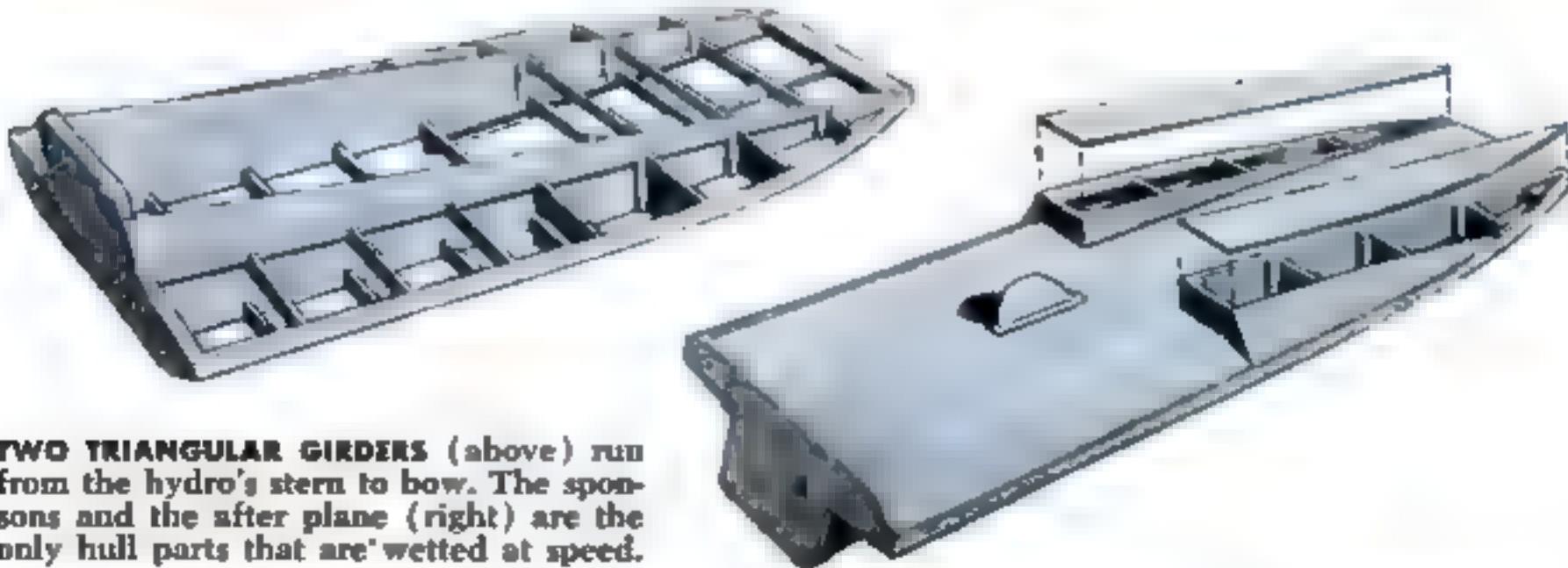
SPRING BOAT FAIR

How to build this outboard hot rod

For less than \$100 and a couple of weeks of easy work, you can build this high-speed hydroplane. It goes like the wind with just a modest motor.



Fancy craftsmanship isn't needed for this hull



TWO TRIANGULAR GIRDERS (above) run from the hydro's stern to bow. The sponsons and the after plane (right) are the only hull parts that are wetted at speed.

See following pages for construction details

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1 FRAMING JIG is laid out on a straight, true, two-by-six. Shape of top edge is a straight line from stern to a point 1" down at station 4; and a second straight line from here to a point 4" down at bow. With a plane, lightly dub off angle change just forward of station 4. The notches are $1\frac{1}{4}$ " deep.

2 FRAMES 4, 5, 6, 7, which differ only in upturn at the ends, are sawed out of $\frac{1}{2}$ " stock. Then they are lined up, clamped together, and planed dead flat on the bottom. Before loosening the clamps, mark and cut notches for the keel and chine battens.

3 TWO IDENTICAL GIRDERS are cut from $\frac{1}{2}$ " stock. Lay out one on a plank 14" wide, or on a piece of $\frac{1}{2}$ " marine plywood, and use it after cutting as a pattern for the second. Mark deck line on what will be the outer side of each. Clamp them together and notch for frames 4, 5, 6 and 7.

4 A DECK BATTEN, its top beveled 8 deg., is glued and screwed to the outer side of each girder. (Don't forget that you have a left one and a right one.) Use waterproof glue and $1\frac{1}{4}$ " No. 8 flathead screws spaced 12" apart.

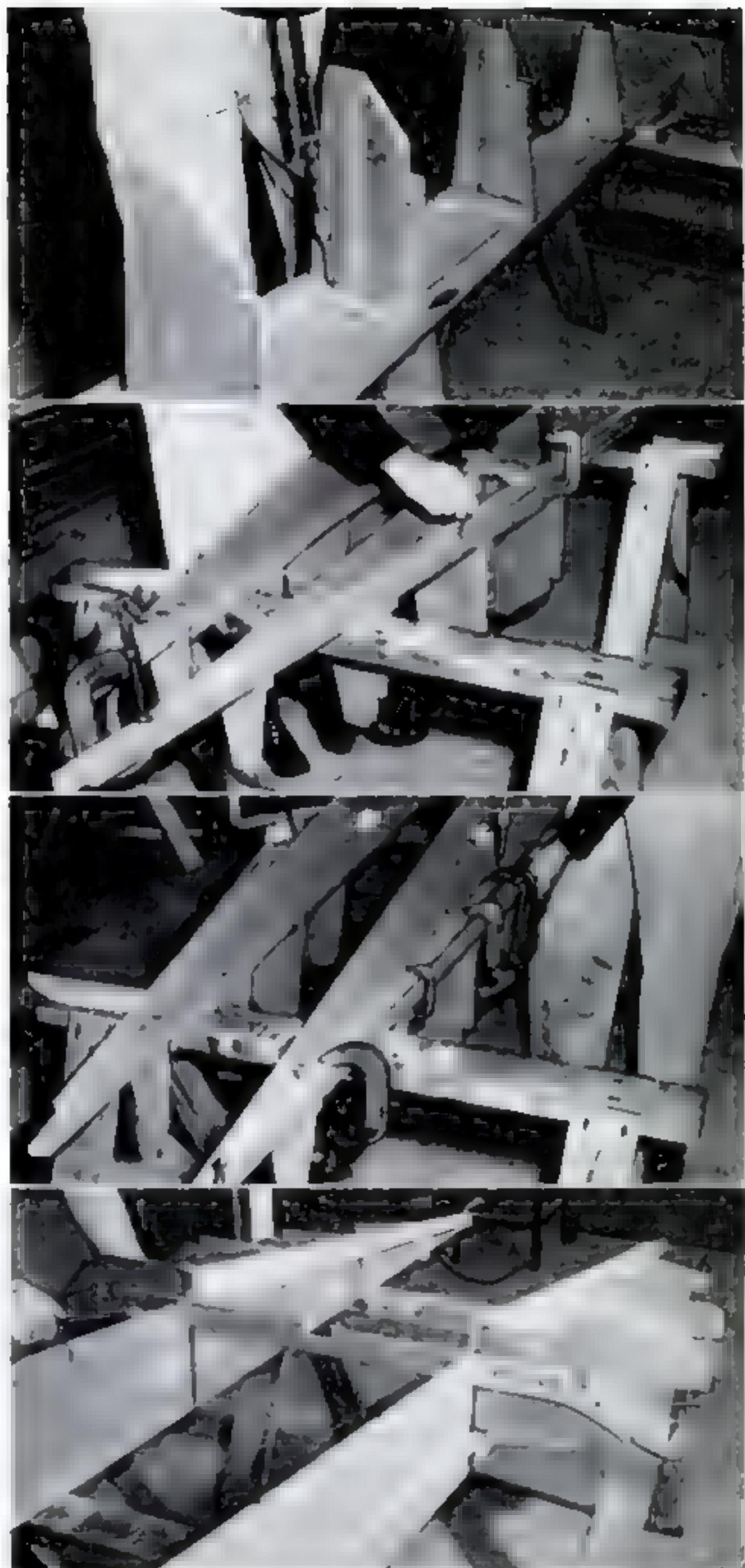
5 STUB FRAMES in pairs are sawed out for stations 1, 2, 3 and 4. Support blocks $\frac{3}{4}$ " square are glued and screwed to each. Then each stub frame is glued and screwed to the outer face of its girder. They are aligned at 90 deg. to the deck batten, not to the bottom.

6 BOTTOM LINE, forward of the sponson ends, is established this way. Each girder is flipped over and a flexible batten clamped in place as shown. Bottom line of the after plane is dead straight; that of the forward plane is nearly so, but it does have a slight curve forward of station 4.

7 A BATTEN $44\frac{1}{4}$ " long is glued and screwed to the inside of each girder along this forward bottom line. It starts 3" short of the girder tip, to leave room for the bow block.

8 SET ON SAWHORSES. The girders are carefully squared up 19" apart. Then frame No. 4 is glued and screwed to its stub frames. Throughout construction, keep checking to make sure that the bottom will be true and unwarped.

[Please turn the page]





9 BOW BLOCK, glued up from two pieces of $\frac{3}{4}$ "-by-3"-by-19" stock and then tapered and notched for the keel batten, is attached between girders. Note the short upright blocks that are glued and screwed to the inside of each girder, to help in securing the deck beams and bottom frames at stations 1, 2 and 3.



10 RUGGED TRANSOM is a must; it will take lots of punishment. This one is built up two pieces of horizontal grain $\frac{3}{4}$ " mahogany for the rear part, doubled in the center section only with two vertical-grain pieces. Marine plywood would do as well. Bottom, deck, and bevel-chine members are added, notched for keel and chine battens. (The notches are not cut through the transom.) Also attached are two vertical strips to help hold the girders.



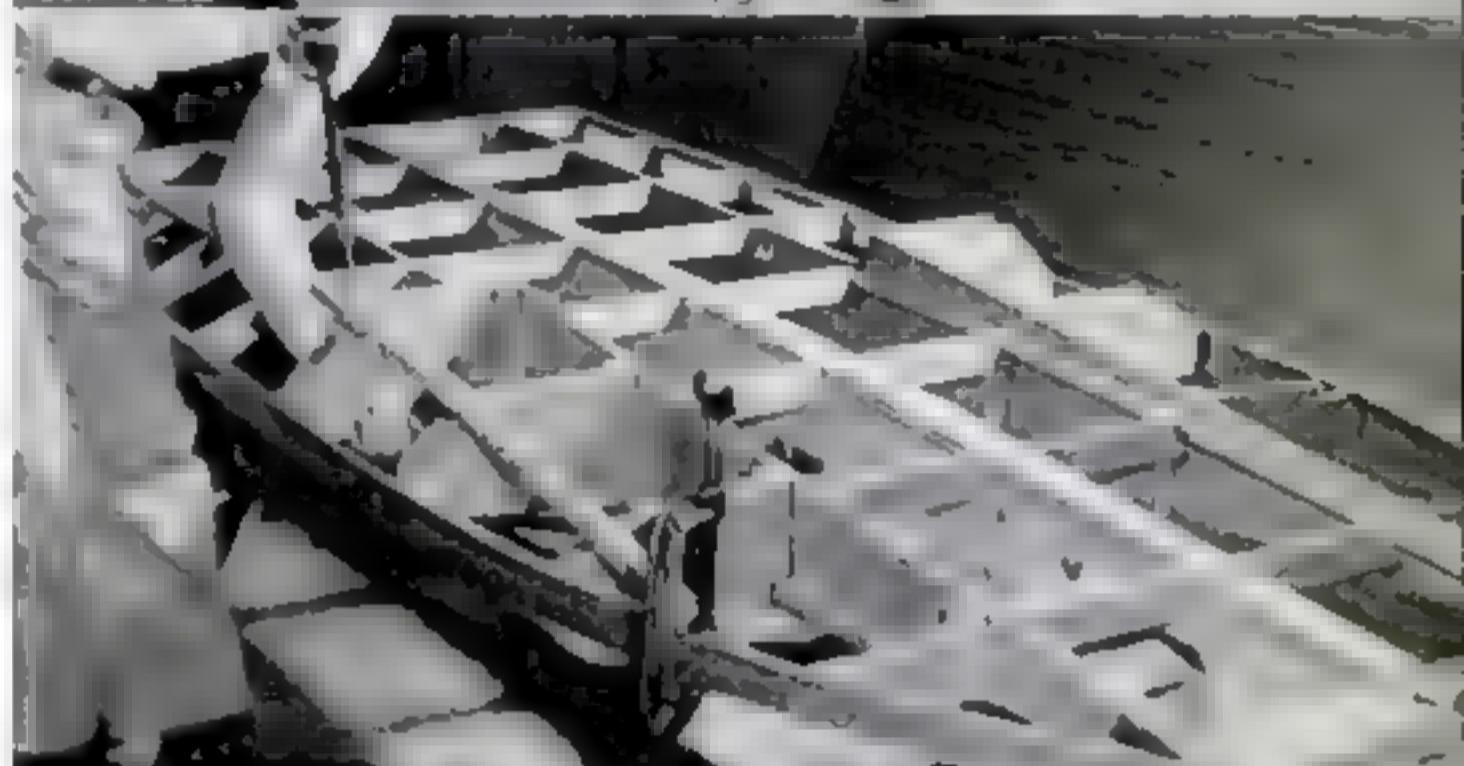
11 FRAMING JIG is first loaded with bottom inside frames 1, 2, 3. Then the girder subassembly is set in place. Transom is clamped on and glued and screwed securely, as are the inside frames in the forward section.

12 SEQUENCE isn't tricky, though it could fool you. Add frames 5, 6 and 7 and then attach the keel batten, taper-cut to fit in the bow-block notch. Keep checking flatness of surfaces that will form the bottom plane.

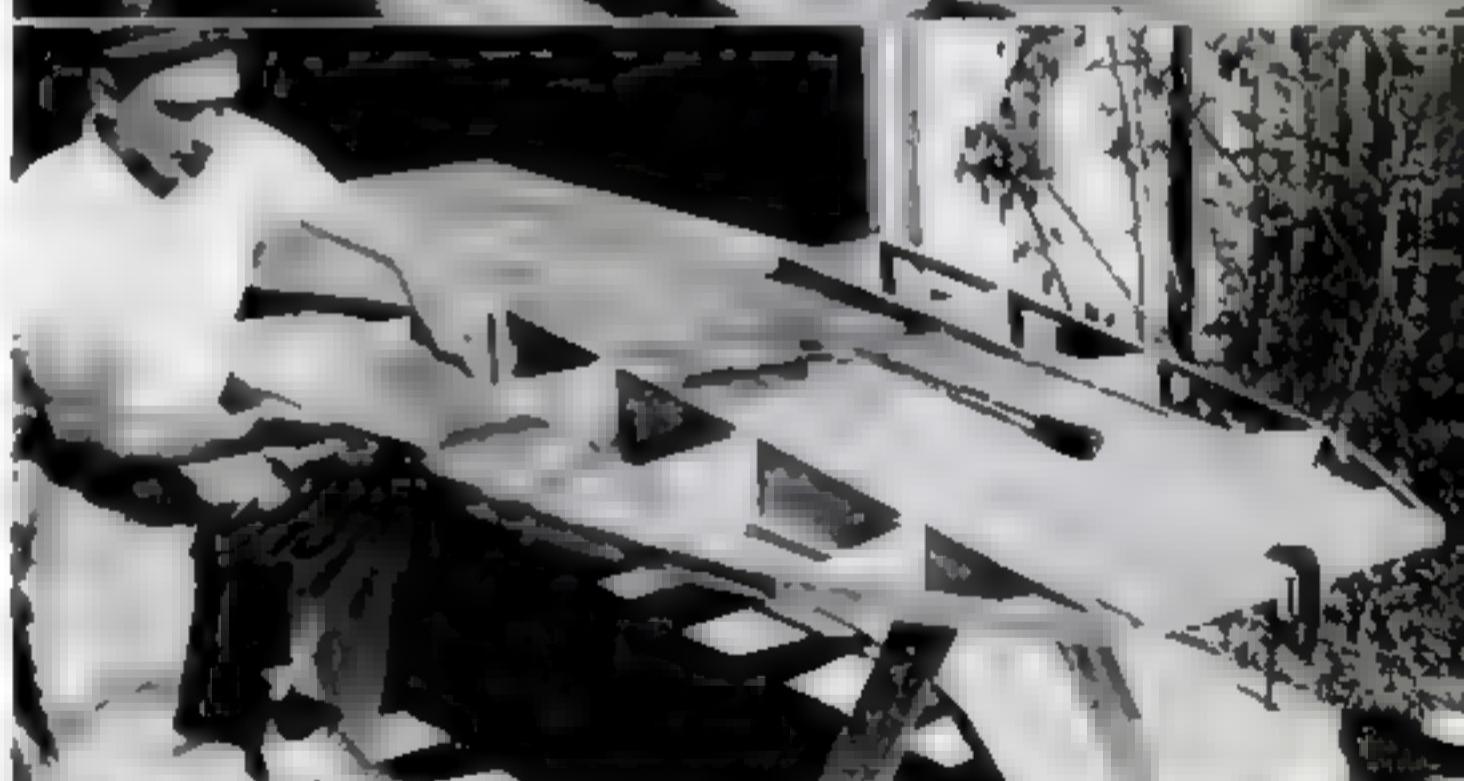
13 CHINE BATTENS come next. The lower chine batten being attached here is beveled after assembly. The main chine battens are attached at the bow first and then bent back. No wood steaming or soaking is necessary.



14 ON THE SPONSONS, lower chine battens run from the main chine battens back as far as the step. Attach first at the forward end and work back. All of the battens are carefully planed to produce chamfers against which the plywood planking can be fastened.



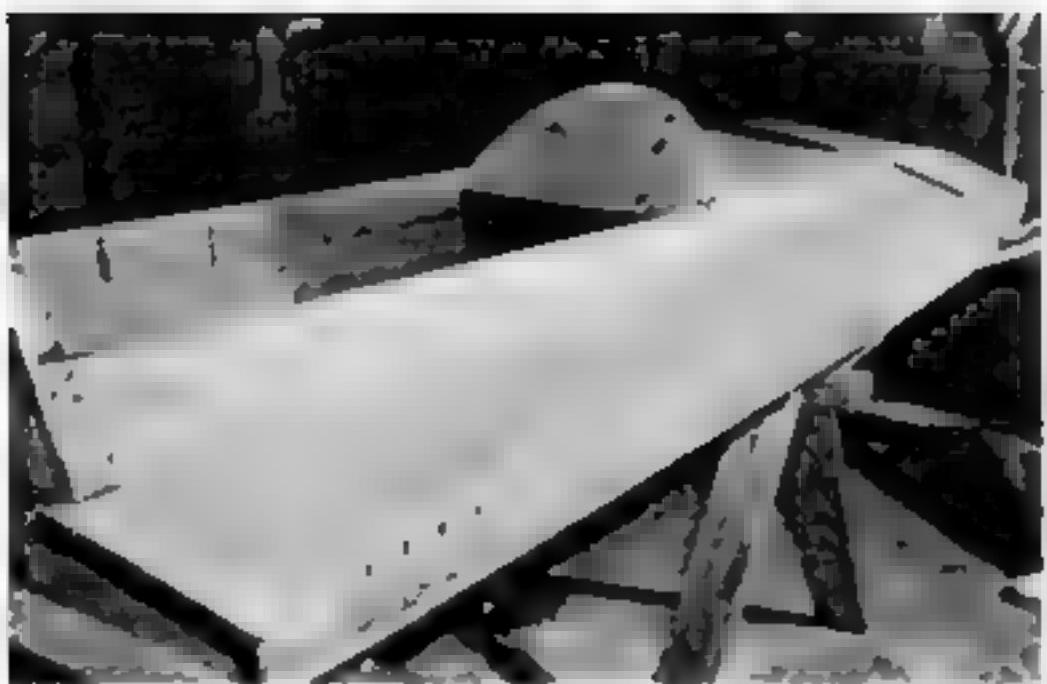
15 ONE 4'-by-8' SHEET of $\frac{1}{4}$ " marine mahogany plywood will plank the bottom if you cut it for minimum waste. In place of glue author used a rubber mastic sealer that makes a slightly flexible watertight joint. Screws are 1" No. 6 flathead, spaced 2" apart. Begin with the bevel-chine planks. Then plane edges flush with the bottom and add the one-piece bottom plank. Use the same sequence with sponsons.



16 WHEEL MOUNT, set at 45 deg., is installed just forward of frame No. 4. Brace it strongly; you'll be hanging on to it for dear life. Deck beams are added at frames 5, 6 and 7. Wedge block on the keel batten near the bow is for screws of the carrying handle.

[Please turn the page]



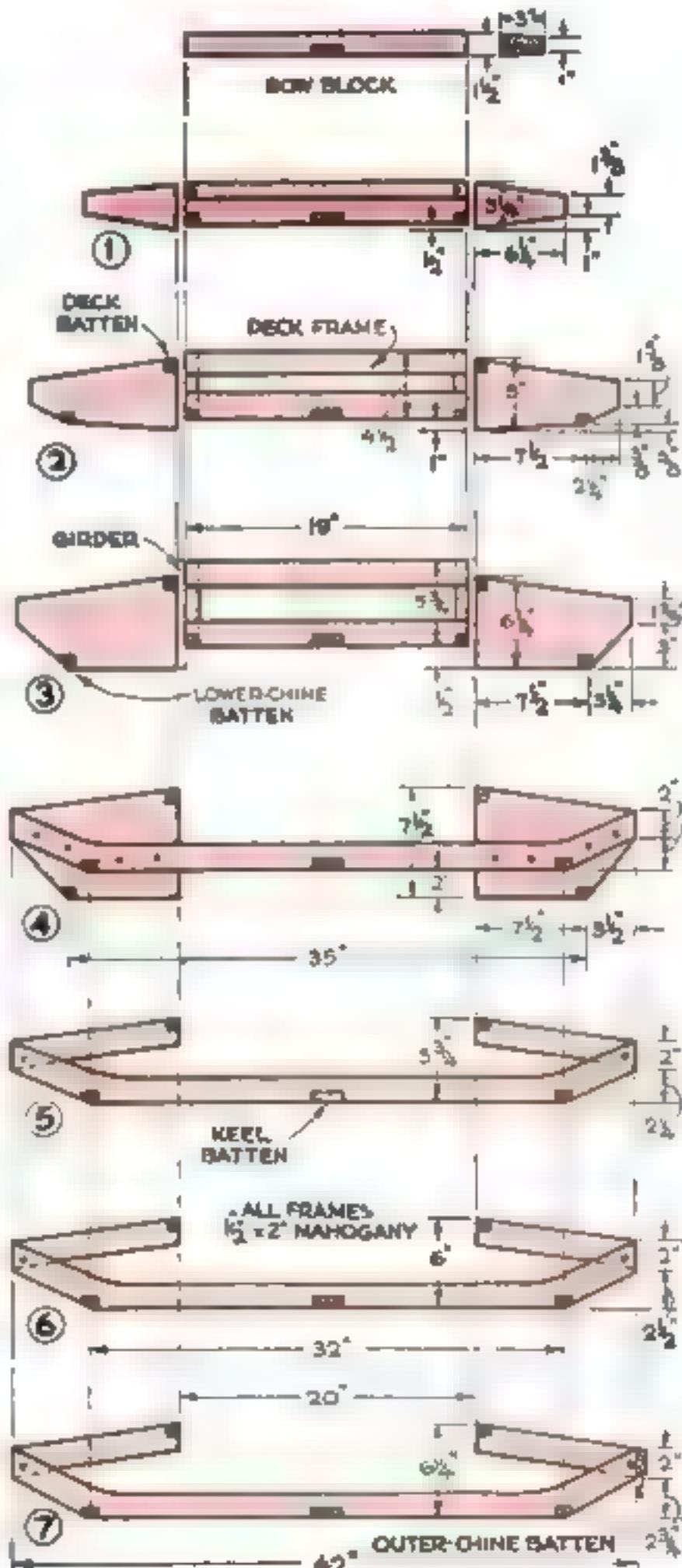


the minimum size), it'll scoot along at about 25 m.p.h. With an ordinary 10, it'll probably outrun the most pompous inboard on the lake. And with one of the hot under-20-cubic-inch jobs made for stock racing, it'll top 50 m.p.h.

• Less than eight feet long and four wide, it can be carried, handled and launched with ease. If you make the fin easily detachable, the hull is a cinch for car-topping.

Tech specs. The boat is a three-point hydroplane, modified so that the sponsons—the small forward steps—are tucked under the hull instead of being on each side in the conventional manner. It conforms, if you want to go racing, to the Class A-B specifications for stock hydros (details obtainable from the National Outboard Association, 707 Market Street, Nashville, Tenn.). Even if you aren't a cup hound, this quick little shin-

17 DECK OVER the raised center section first and then the two sides. Shape a cowling of .040" dural and attach to the wheel mount and deck. Sand the entire hull carefully before applying finish. Add the aluminum fin and a $\frac{1}{4}$ "-plywood floorboard; rig the wheel and the crash throttle. Then you're ready to head for the water.



WHAT YOU'LL NEED

Bottom, deck, floorboard:	2 panels, $\frac{1}{4}$ "x4'x8' marine plywood
Transom, keel and chine battens, bow block, misc. cleats:	1 piece, $\frac{1}{4}$ "x12"x14' Philippine mahogany
Frames, deck beams, outer chine battens, etc.:	1 piece, $\frac{1}{2}$ "x12"x14' Philippine mahogany
Girders:	2 pieces, $\frac{1}{4}$ "x14"x8' Philippine mahogany
Framing jig:	1 piece, 2"x8"x8' fir
Cowling:	.040"x16"x26" dural
Cadmium-plated screws:	7 gross 1" No. 6; 2 gross 1 1/4" No. 8; 1 gross, 1 1/2" No. 8.
Waterproof resin glue, mastic batten and seam sealer, clear spar varnish, enamel.	

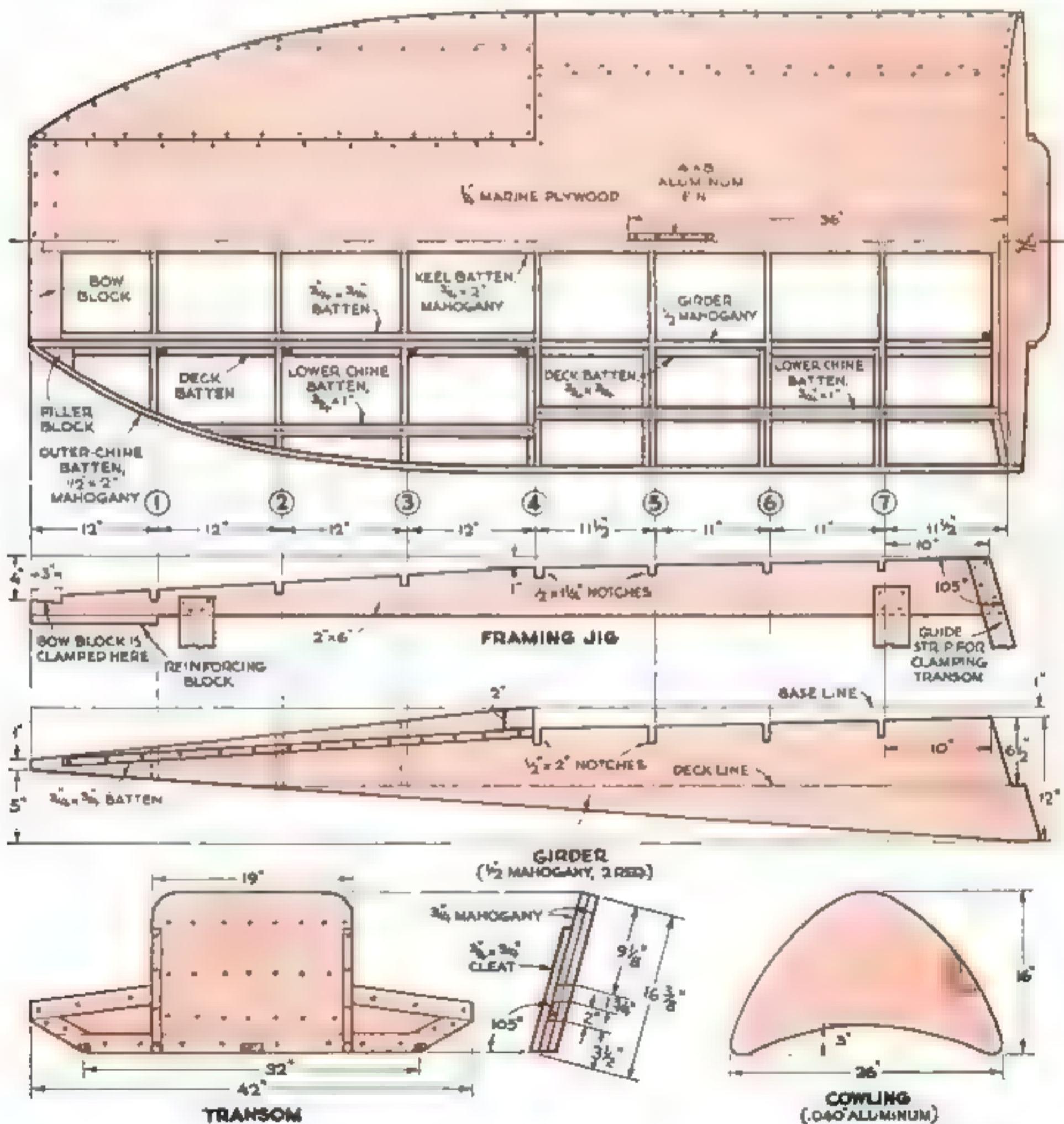
gle will give you plenty of excitement zipping about home waters.

Facts of life. People not familiar with small hydros should be counseled that this is no craft for rough weather or for picnic cruising with lady friends. Its one-man cockpit is 19 inches wide. You drive kneeling on a sponge-rubber pad. A life jacket is uniform-of-the-day; and an automatic crash throttle, to cut the engine if you bounce gaily overboard, is a must. The boat has no amenities and virtually no utility—just pure fun.

The boat can be built in the basement or garage—anywhere that you have about 10 feet of clear space. The job will go much easier if you have a spiral screwdriver and a screw-hole drill. A table saw or bandsaw is useful but not essential.

For a "fast bottom," three coats of clear spar varnish serve nicely. Topsides can be finished in any way that suits your fancy. Costly marine enamels are not necessary, because a hydro is not usually left in the water or exposed to weather except when it's in use.

END





Buyer's guide to

HIgher horsepower, slick styling and colors, and new convenience gadgetry—these are the lures built into the 1956-model outboard motors. The parallel with autos is no coin-

cidence; the outboard makers have been eying Detroit's mass-market success.

By boosting compression ratios, most manufacturers have coaxed out a few more horsepower than you got last year.



MAKE	HORSEPOWER	NO. OF CYL.	DISPLACEMENT (cubic inches)	DIAMETER & PITCH inches	NO. OF BLADES	CAPACITY gallons	TYPE (Integral or Remote)	ENGINE WEIGHT (lb.)	PROPELLER - FUEL TANK		MANUAL OR ELECTRIC START	PRICE (f.o.b. factory)
									1	2		
BROOKLURE Model 22011	25 @ 4,000 r.p.m.	2	35.7	10.4 x 12.5	3	6	rem.	119	man	\$430		
BROOKLURE Model 220E11	25 @ 4,000 r.p.m.	2	35.7	10.4 x 12.5	3	6	rem.	129	elec.	\$520		
BUCCANEER 25-hp. De Luxe	25 @ 4,000 r.p.m.	2	35.7	10.4 x 12.5	3	6	rem.	119	man	\$430		
BUCCANEER 25-hp. Electric	25 @ 4,000 r.p.m.	2	35.7	10.4 x 12.5	3	6	rem.	129	elec.	\$520		
ELGIN Model 5940	25 @ 4,000 r.p.m.	2	37.7	10.4 x 11.5	3	6	rem.	118	man	\$380		
ELGIN Model 5960	25 @ 4,000 r.p.m.	2	37.7	10.4 x 11.5	3	6	rem.	129	elec.	\$450		
ELTO 25	25 @ 4,000 r.p.m.	2	35.7	10.4 x 12.5	3	5	rem.	119	man	\$480		
ELTO 25 Electric	25 @ 4,000 r.p.m.	2	35.7	10.4 x 12.5	3	5	rem.	129	elec.	\$580		
EVINRUDE Big Twin Standard	30 @ 4,500 r.p.m.	2	35.7	10.4 x 12.5	3	6	rem.	113	man.	\$462		
EVINRUDE Big Twin Electric	30 @ 4,500 r.p.m.	2	35.7	10.4 x 12.5	3	6	rem.	127	elec.	\$552		
EVINRUDE Lark	30 @ 4,500 r.p.m.	2	35.7	10.4 x 12.5	3	6	rem.	130	elec.	\$582		
FIRESTONE 30-hp. 3-sh. ft.	30 @ 4,200 r.p.m.	2	40.5	10 x 14	12	6	rem.	117	man.	\$450		
FIRESTONE 30-hp. Electric	30 @ 4,200 r.p.m.	2	40.5	10 x 14	12	6	rem.	127	elec.	\$540		
JOHNSON Sea Horse 30	30 @ 4,500 r.p.m.	2	35.7	10.4 x 12.5	3	6	rem.	112	man	\$462		
JOHNSON Sea Horse 30 Electric	30 @ 4,500 r.p.m.	2	35.7	10.4 x 12.5	3	6.2	rem.	126	elec.	\$552		
JOHNSON Javelin	30 @ 4,500 r.p.m.	2	35.7	10.4 x 12.5	3	6.2	rem.	128	elec.	\$582		
MERCURY Mark 25	20 @ 5,400 r.p.m.	2	19.8	not available	6	rem.	75	man	\$395			
MERCURY Mark 25E	20 @ 5,400 r.p.m.	2	19.8	not available	6	rem.	85	elec.	\$485			
MERCURY Mark 30	30 @ 5,400 r.p.m.	4	29.7	not available	6	rem.	110	man	\$480			
MERCURY Mark 30E	30 @ 5,400 r.p.m.	4	29.7	not available	6	rem.	118	elec.	\$605			
MERCURY Mark 55	40 @ 5,400 r.p.m.	4	39.6	not available	6	rem.	113	man	\$605			
MERCURY Mark 55E	40 @ 5,400 r.p.m.	4	39.6	not available	6	rem.	121	elec.	\$730			
OLIVER 35-hp.	35 @ 4,000 r.p.m.	2	42	not available	6	rem.	120	elec.	n.a.			
RILEY 75-hp.	75 @ 4,500 r.p.m.	3	127	varies	3	varies	rem.	250	elec.	\$1,428		
ROYAL 25-hp. De Luxe	25 @ 4,000 r.p.m.	2	35.7	10.4 x 12.5	3	6	rem.	119	man	\$430		
ROYAL 25-hp. Electric	25 @ 4,000 r.p.m.	2	35.7	10.4 x 12.5	3	6	rem.	129	elec.	\$520		
SCOTT-ATWATER 33-hp.	33 @ 4,200 r.p.m.	2	42.2	10 x 14	2	6	rem.	130	man	\$470		
SCOTT-ATWATER 33-hp. Electric	33 @ 4,200 r.p.m.	2	42.2	10 x 14	2	6	rem.	140	elec.	\$560		
SEA BEE 25-hp. De Luxe	25 @ 4,200 r.p.m.	2	32.6	10.4 x 12.5	3	6	rem.	110	man	\$430		
SEA BEE 25-hp. Electric	25 @ 4,200 r.p.m.	2	32.6	10.4 x 12.5	3	6	rem.	125	elec.	\$520		
SEA KING 25-hp. De Luxe	25 @ 4,000 r.p.m.	2	35.7	10.4 x 12.5	3	6	rem.	119	man	\$375		
SEA KING 25-hp. Electric	25 @ 4,000 r.p.m.	2	35.7	10.4 x 12.5	3	6	rem.	129	elec.	\$455		
WIZARD Super Power 25	25 @ 4,000 r.p.m.	4	29.8	not avail.	2	6	rem.	108	man	\$425		
WIZARD Super Power 25 Electric	25 @ 4,000 r.p.m.	4	29.8	not avail.	2	6	rem.	120	elec.	\$515		

1956 outboards

Scott-Atwater's 30-hp. motor of a year ago, which touched off the present horsepower race, is now 33 hp.; the Evinrude and Johnson 25s have jumped to 30 hp.; Mercury has added a 30-hp. model to its

line, and Oliver is now offering a 35-horse job.

There's a notable preoccupation with styling and color. Examples: Johnson has retired its traditional Sea Horse green

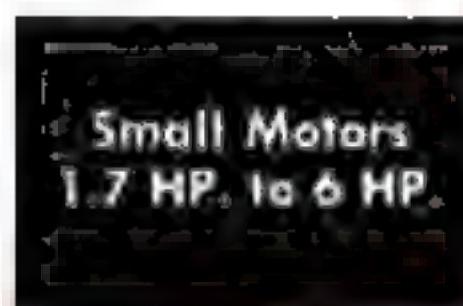
MAKE	HORSEPOWER	NO. OF CYLINDERS	PROPELLER		FUEL TANK	TYPE (Integral or remote)	ENGINE WEIGHT (lb.)	MANUAL ELECTRIC START	PRICE (F.O.B. factory)	
			DISPLACEMENT (cubic inches)	DIA. X PITCH (in inches)						
BROOKLURE Model 12013	12 @ 4,000 r.p.m.	2	17.9	9 x 11	3	6	rem.	75	man.	\$340
BUCCANEER 12-hp. Standard	12 @ 4,000 r.p.m.	2	17.9	9 x 11	3	2	int.	66	man.	\$302
BUCCANEER 12-hp. De Luxe	12 @ 4,000 r.p.m.	2	17.9	9 x 11	3	6	rem.	75	man.	\$340
BUCCANEER 12-hp. Electric	12 @ 4,000 r.p.m.	2	17.9	9 x 11	3	6	rem.	86	elec.	\$430
CHAMPION 7.8-hp. De Luxe	7.8 @ 4,300 r.p.m.	2	9.6	7 x 9.5	2	3.5	rem.	46	man.	\$264
CHAMPION 15.5-hp. De Luxe	15.5 @ 4,300 r.p.m.	2	19.9	8 x 11	3	6	rem.	54	man.	\$365
ELGIN Model 5970	7.5 @ 4,000 r.p.m.	2	12	8 x 8	2	4.5	rem.	52	man.	\$200
ELGIN Model 5890	12 @ 4,000 r.p.m.	2	17.7	8.5 x 8	3	6	rem.	61	man.	\$280
ELTO 12 (Canada only)	12 @ 4,000 r.p.m.	2	17.9	9 x 11	3	5	rem.	75	man.	\$369
EVINRUDE Fleetwin	7.5 @ 4,000 r.p.m.	2	12.4	8 x 8.5	2	4.2	rem.	58	man.	\$241
EVINRUDE Sportwin	10 @ 4,000 r.p.m.	2	16.6	9 x 8	3	6	rem.	72	man.	\$321
EVINRUDE Fastwin Standard	15 @ 4,000 r.p.m.	2	19.9	9 x 11	3	6	rem.	75	man.	\$362
EVINRUDE Fastwin Electric	15 @ 4,000 r.p.m.	2	19.9	9 x 11	3	6	rem.	86	elec.	\$452
FIRESTONE 10-hp. 3-Shift	10 @ 4,200 r.p.m.	2	14.8	8.1 x 10	2	6	rem.	59	man.	\$300
FIRESTONE 15-hp. 3-Shift	15 @ 4,200 r.p.m.	2	19.9	9 x 8	2	6	rem.	68	man.	\$350
JOHNSON Sea Horse 7½	7.5 @ 4,000 r.p.m.	2	12.4	8 x 8.5	2	4.2	rem.	58	man.	\$241
JOHNSON Sea Horse 10	10 @ 4,000 r.p.m.	2	16.6	9 x 8	3	6	rem.	71	man.	\$321
JOHNSON Sea Horse 15	15 @ 4,000 r.p.m.	2	19.9	9 x 11	3	6	rem.	75	man.	\$362
JOHNSON Sea Horse 15 Electric	15 @ 4,000 r.p.m.	2	19.9	9 x 11	3	6	rem.	89	elec.	\$452
MAJESTIC 7.8-hp. Gearshift	7.8 @ 4,300 r.p.m.	2	9.6	7.5 x 9.5	2	1.2	int.	47	man.	\$235
MAJESTIC 15-hp. Gearshift	15 @ 4,300 r.p.m.	2	19.9	8 x 11	3	6	rem.	54	man.	\$335
OLIVER 15-hp.	15 @ 4,000 r.p.m.	2	19.9	9.2 x 11.5	3	6	rem.	75	man.	\$360
ROYAL 12-hp.	12 @ 4,000 r.p.m.	2	17.9	9 x 11	3	6	rem.	75	man.	\$340
SCOTT-ATWATER 7½-hp.	7.5 @ 4,200 r.p.m.	2	11	8 x 7	2	6	rem.	49	man.	\$246
SCOTT-ATWATER 10-hp.	10 @ 4,200 r.p.m.	2	14.8	8.1 x 9.5	2	6	rem.	58	man.	\$306
SCOTT-ATWATER 16-hp.	16 @ 4,200 r.p.m.	2	19.9	9 x 10	2	6	rem.	75	man.	\$358
SCOTT-ATWATER 16-hp. Electric	16 @ 4,200 r.p.m.	2	19.9	9 x 10	2	6	rem.	84	elec.	\$446
SEA BEE 12-hp. De Luxe	12 @ 4,000 r.p.m.	2	17.9	9 x 11	3	6	rem.	68	man.	\$340
SEA KING 12-hp. De Luxe	12 @ 4,000 r.p.m.	2	17.9	9 x 11	3	6	rem.	75	man.	\$285
SEA KING 12-hp. Electric	12 @ 4,000 r.p.m.	2	17.9	9 x 11	3	6	rem.	86	elec.	\$365
VOYAGER 15-hp. Gearshift	15 @ 4,300 r.p.m.	2	19.9	8 x 11	3	6	rem.	54	man.	\$335
WIZARD Super 10	10 @ 4,000 r.p.m.	2	19.8	not avail.	3	6	rem.	62	man.	\$240
WIZARD Powermatic 12	12 @ 4,000 r.p.m.	2	19.8	not avail.	2	6	rem.	72	man.	\$300

in favor of "holiday bronze," and Mercury is proudly proclaiming that its styling was awarded a gold medal from the Fashion Academy.

Gearshifts, electric starting, remote fuel tanks and provision for remote controls have spread widely. Half the small motors now come with gearshifts, and many of the motors can be easily hooked up to remote controls. In the medium-sized range, shifts and remote tanks are almost universal, and you can get electric

starting on many. On big motors you can get the works, of course.

Rope starters may follow auto cranks into oblivion if the Evinrude Lark and Johnson Javelin start a trend: They have no manual starters at all. These two makes also use a neat trick on their manual-starting models. The plate or drum on which the starting cable winds up is now oval-shaped instead of round—to give extra leverage as the compression comes up.—*Erik H. Arctander*.



MAKE	HORSEPOWER	NO. OF CYL.	DISPLACEMENT (cubic inches)	PROPELLER DIAMETER & PITCH (in inches)	FUEL TANK CAPACITY (gallons)	TYPE (integral or remote)	ENGINE WEIGHT (lb.)	GEARSHIFT (two-neut rev.)	PRICE C.U.D. (factory)
BROOKLURE Model 3D13	3 @ 4,000 r.p.m.	1	5.3	6.4 x 6.9	2	5	nt	30	none
BROOKLURE Model 5S12S	5 @ 4,000 r.p.m.	2	8.8	7.5 x 7.3	2	8	nt	45	none
BROOKLURE Model 5012	5 @ 4,000 r.p.m.	2	8.8	8 x 7.3	2	9	nt	52	f.n.r
BUCCANEER 3-hp. De Luxe	3 @ 4,000 r.p.m.	1	5.3	6.4 x 6.9	2	5	int	30	none
BUCCANEER 5-hp. Standard	5 @ 4,000 r.p.m.	2	8.8	7.5 x 7.3	2	8	int	45	none
BUCCANEER 5-hp. De Luxe	5 @ 4,000 r.p.m.	2	8.8	8 x 7.3	2	9	nt	52	f.n.r
CHAMPION Guide Four	4.2 @ 4,300 r.p.m.	3	5.8	7.5 x 6	2	12	int	42	none
CHAMPION Guide 5 x	6 @ 4,300 r.p.m.	2	9.6	7.5 x 9	2	12	int	46	f.n.r
ELC N Model 5821	2 @ 4,000 r.p.m.	1	3.7	6.5 x 4	2	6	int	28	none
ELC N Model 5950	5.5 @ 4,000 r.p.m.	2	10.6	7.5 x 7	2	45	rem	52	f.n.r
ELTO 3 (Canada only)	3 @ 4,000 r.p.m.	1	5.3	6.4 x 6.9	2	4	nt	30	none
ELTO 5 (Canada only)	5 @ 4,000 r.p.m.	2	8.8	8 x 7.3	2	7	int	52	f.n.r
EVINRUDE Lightwin	3 @ 4,000 r.p.m.	2	5.3	6.1 x 6.3	2	7	int	32	none
EVINRUDE Fisherman	5.5 @ 4,000 r.p.m.	2	8.8	8 x 7.3	2	42	rem	51	f.n.r
FIRESTONE 3.6-hp. Non-Shift	3.6 @ 4,000 r.p.m.	1	6.2	7.5 x 6	2	1	int	36	none
FIRESTONE 5-hp. 3-Shift	5 @ 4,200 r.p.m.	2	7.5	7.5 x 6	2	35	rem	42	f.n.r
JOHNSON Sea Horse 3	3 @ 4,000 r.p.m.	2	5.3	6.1 x 6.3	2	7	int	32	none
JOHNSON Sea Horse 5½	5.5 @ 4,000 r.p.m.	2	8.8	8 x 7.3	2	42	rem	51	f.n.r
LAUSON Single	3 @ 4,000 r.p.m.	1	6.6	7.5 x 6	2	6	nt	44	none
LAUSON Twin	6 @ 4,000 r.p.m.	2	13.3	8 x 6.5	2	12	nt	57	none
LAUSON Twin, Neutral Clutch	6 @ 4,000 r.p.m.	2	13.3	8 x 6.5	2	12	nt	57	f.n.
MAJESTIC C Fisherman Special	4.2 @ 4,300 r.p.m.	3	5.8	7.5 x 6	2	12	int	42	none
MAJESTIC M-3N Gearshift	6 @ 4,300 r.p.m.	2	9.6	7.5 x 9	2	12	nt	46	f.n.r
MERCURY Mark 6	5.9 @ 4,500 r.p.m.	2	7.2	not available	3.2	rem	42	f.n.	\$225
NEPTUNE Mighty Mile	1.7 @ 4,000 r.p.m.	1	3.0	6 x 5	2	3	nt	17	none
OLIVER 5½-hp.	5.5 @ 4,000 r.p.m.	2	9.4	6.7 x 8	3	35	rem	45	f.n.r
ROYAL 3-hp. De Luxe	3 @ 4,000 r.p.m.	1	5.3	6.4 x 6.9	2	5	int	30	none
ROYAL 5-hp. De Luxe	5 @ 4,000 r.p.m.	2	8.8	8 x 7.2	2	9	int	53	f.n.r
SCOTT-ATWATER 3.6-hp.	3.6 @ 4,000 r.p.m.	1	6.2	7.5 x 6	2	1	nt	35	none
SCOTT-ATWATER 5-hp.	5 @ 4,200 r.p.m.	2	7.5	7.5 x 6	2	35	rem	45	f.n.r
SEA BEE 3-hp. De Luxe	3 @ 4,000 r.p.m.	1	5.3	6.4 x 6.9	2	5	int	29	none
SEA BEE 5-hp. Standard	5 @ 4,000 r.p.m.	2	8.8	7.5 x 7.2	2	8	int	45	none
SEA BEE 5-hp. De Luxe	5 @ 4,000 r.p.m.	2	8.8	8 x 7.2	2	9	nt	49	f.n.r
SEA KING 3-hp. De Luxe	3 @ 4,000 r.p.m.	1	5.3	6.4 x 6.9	2	5	int	30	none
SEA KING 5-hp. De Luxe	5 @ 4,000 r.p.m.	2	8.8	8 x 7.2	2	9	nt	52	f.n.r
VOYAGER Fisherman Special	4.2 @ 4,300 r.p.m.	1	5.8	7.5 x 6	2	12	nt	42	none
VOYAGER Gearshift	6 @ 4,300 r.p.m.	2	9.6	7.5 x 9.5	2	12	int	46	f.n.r
WIZARD Super 5	5 @ 4,000 r.p.m.	2	7.2	not avail	2	32	rem	40	f.n.

You'll Soon Ride Two-Headed Trains

This push-pull flyer will streak between cities at high speed—"turn around" without moving.

By Henry B. Comstock

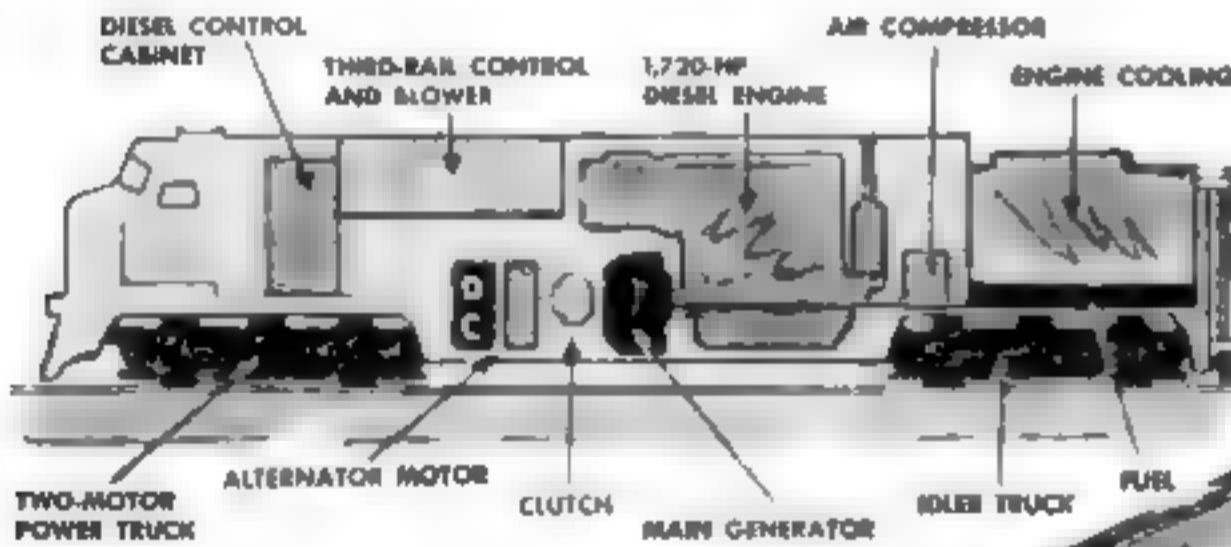
A TRACK-HUGGING passenger train with a locomotive at each end—one pulling, the other pushing—may set the pattern for tomorrow's rail runs of less than 300 miles.

This two-headed flyer is scheduled to be skimming up and down the main line of the New York, New Haven and Hartford Railroad late this year. It will

knock off the curvy 220 miles between New York City and Boston in three hours—a whole hour less than today's best rail travel time.

Headaches. Winding through the heavily industrial area that joins the two cities, the New Haven has its special problems, including high-density traffic, big commuting loads at each end, and a tunnel-reached terminal in New York's Grand Central Station where exhaust fumes from diesel engines are strictly forbidden.

Added to these problems have been so many recent service delays, some laid to



NEW TRAIN has five three-unit Talgo cars, each car wheeled at both ends. Car units are coupled above a single pair of wheels.

heavy flood damage, that the line is in dutch with its riders and with state regulatory agencies. A glittering new train, the New Haven hopes, may help the line to get off some hooks.

Tough specs. Fancy lightweight Talgo coaches will make up the showpiece train. To pull-push them at record speed will be a pair of locomotives unlike any ever built before. The president of the New Haven Railroad laid down the specifications to Fairbanks-Morse and Co. engineers this way:

"I want a pair of diesels that can run nonstop between New York and Boston. They must be able to go into the electric-only tunnels at Grand Central Station. They must have more horsepower than any of the units now being designed for lightweight trains—enough to take care of all the electrical apparatus in five coaches, and the traction motors.

"And I don't want the locomotives coupled together. I want one at each end of the train, to cut out the 15 miles of switching that it now takes to turn around one of our blue-ribbon trains."

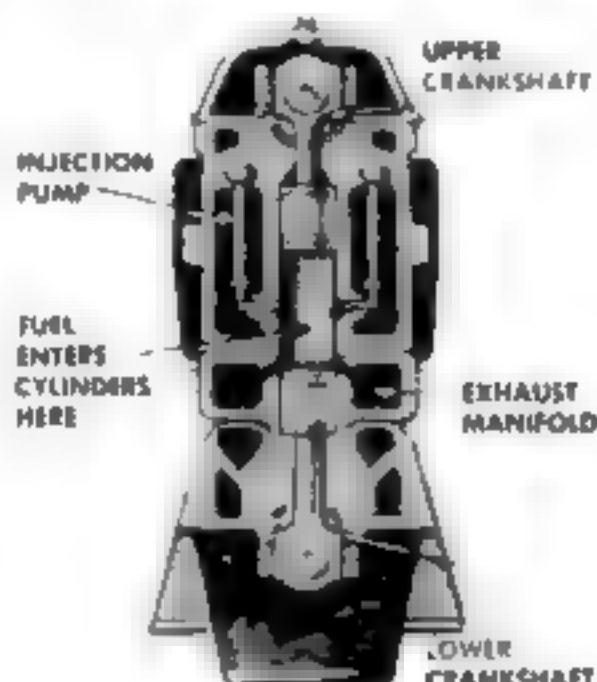
Fairbanks-Morse has come up with all these features in what it calls its "Speed Merchants," a pair of diesel-electrics that are packed with engineering savvy. The tough requirements were met by breaking down the problems one by one in this fashion:

Two heads. Back in the mid-Thirties, the New Haven had experimented with a three-car train having a diesel engine at each end. Called the "Comet," it shuttled between Boston and Providence. Unfortunately, one head didn't always know what the other head was doing. The Comet was plagued by a faulty control system that threatened to buckle the train like an inchworm each time it made a stop.

That won't happen now. A refined

Radical new train designs like

Five types of radically new trains are now being built by four car builders, working with three locomotive manufacturers. One or more of these designs may solve the biggest problem that has plagued the railroads—especially the big commuting lines—since World War II: how to make their passenger traffic pay off. All five of the new designs are shown on the opposite page.



CROSS-SECTION of Fairbanks-Morse engine shows opposed pistons. The two crankshafts are connected with bevel gears and a shaft at engine's rear.

control and throttling system will make the two big engines respond to a touch of a controller at either end of the 580-foot-long train. Automatic couplers with 32 contacts are on each locomotive, tying to an electrical "spinal cord" running the length of the cars. Its circuits will keep two locomotives in exact coordination. When turn-around time comes at either station, the enginemen will simply pick up their grips and walk from one cab to the one on the other end.

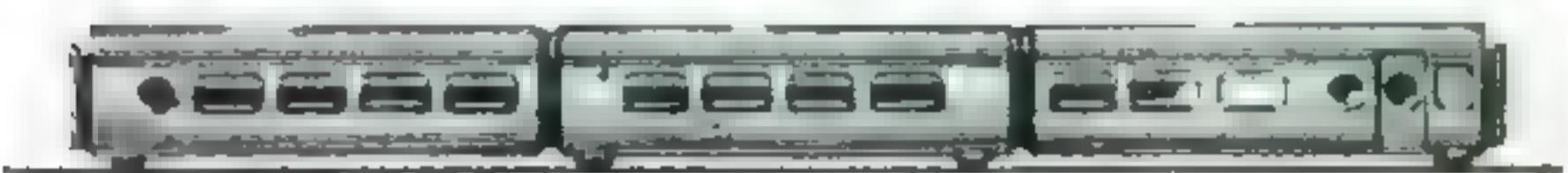
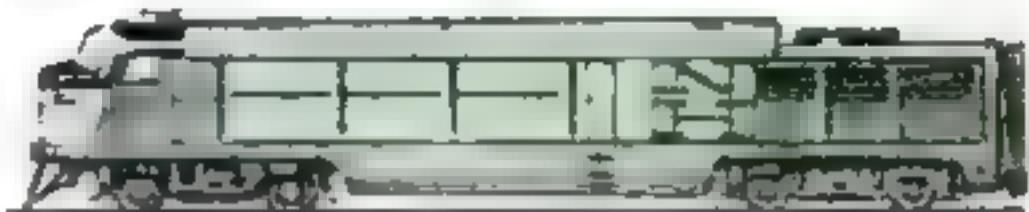
Opposed pistons. To get the high horsepower the New Haven wants, Fairbanks-Morse is using big, opposed-piston diesels rated at 1,750 horsepower apiece. Each of the eight-cylinder engines is in effect two engines bolted head to head. Each cylinder has two pistons, one plunging downward and the other upward whenever the air-oil mixture fires between them.

Their two crankshafts are geared to a common output shaft that drives a big DC generator. The traction motors beneath each locomotive will get 1,200 horsepower with the leftover 550 at each end feeding to the auxiliaries.

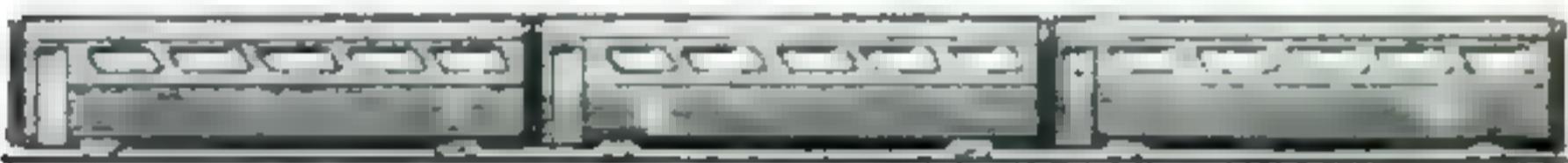
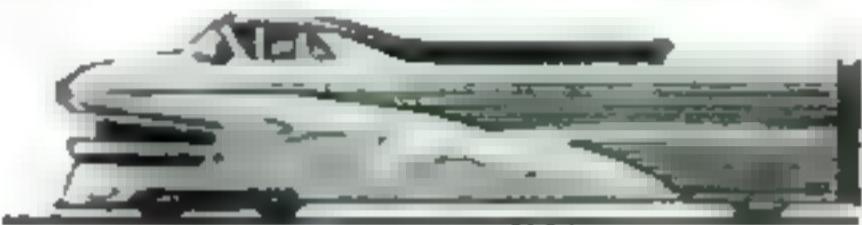
The tunnel trick. The problem of getting into Grand Central's no-diesel trackage seemed to have a simple solution: just shut down the diesels and collect the juice from the third rail system there. That's how it will be done, though the

these promise to pare off deadweight and boost rail speeds

TALGO: One train each for New Haven and Rock Island. Coaches by A.C.F.; New Haven engines by Fairbanks-Morse; for Rock Island a GM diesel.



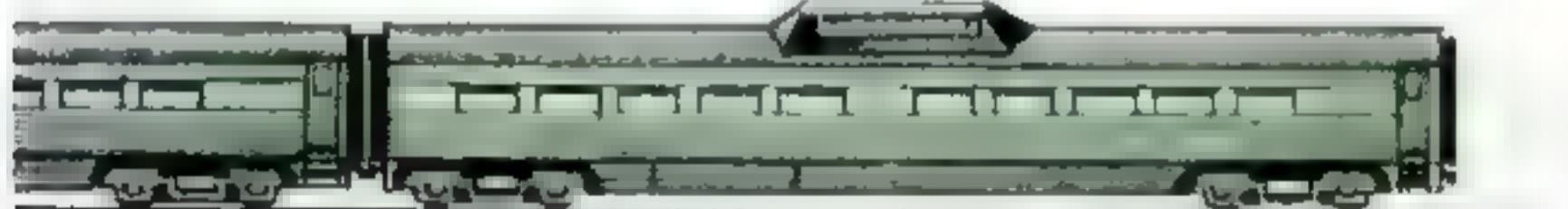
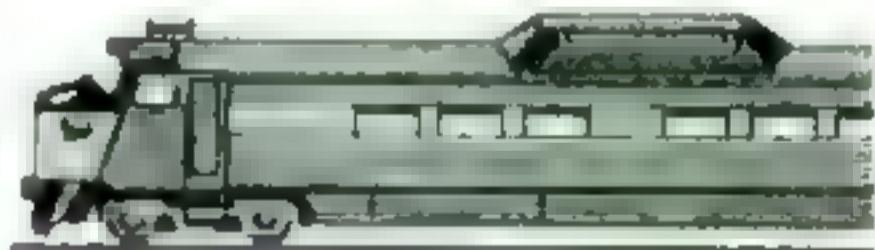
AEROTRAIN: Two trains, with locomotives, built by GM and bought by Pennsy and N.Y. Central. Union Pacific is another prospective buyer.



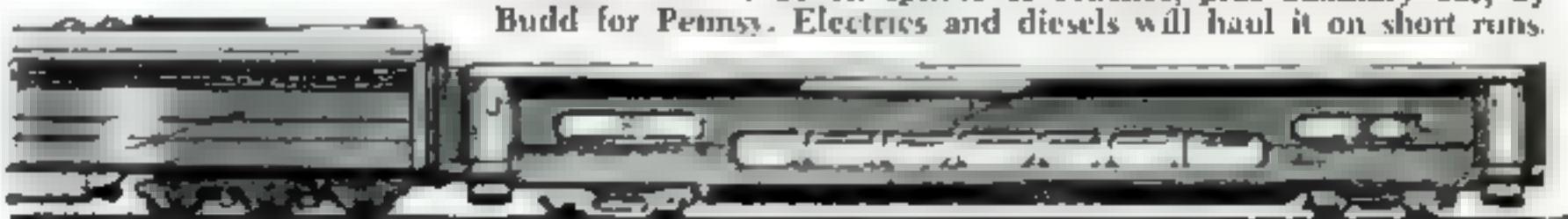
TRAIN X: One train each for N.Y. Central and New Haven. Coaches by Pullman-Standard. Locomotives (diesels with mechanical drive) by Baldwin.

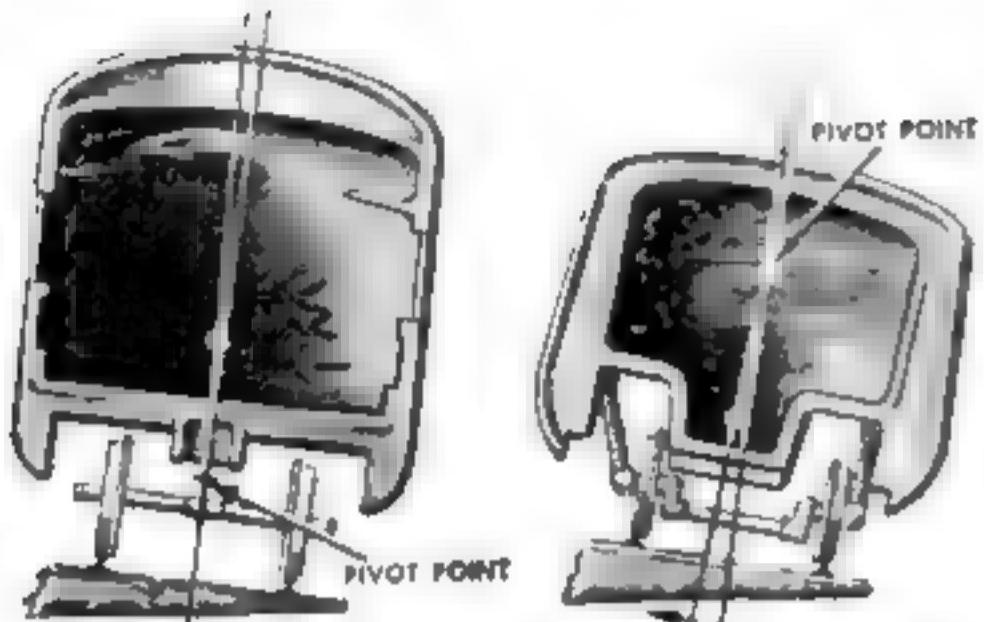


HOT-ROD: One train for New Haven. Six self-propelled diesel coaches by Budd. Cars will have mechanical drive, electric motors for third-rail use.



TUGULAR TRAIN: Seven split-level coaches, plus auxiliary car, by Budd for Pennsy. Electrics and diesels will haul it on short runs.





HIGH CENTER OF GRAVITY gives standard coach (left) an unstable metronome action on curves. Talgo car's low center of gravity and deep springing lets the car bank inward (right).

job was by no means a simple one to engineer.

When Grand Central's 33 miles of tunnel track was electrified about 50 years ago, the power chosen was 600-volt direct current. This, fortunately, is the same kind and voltage of electricity used in all of today's diesel-electric locomotives. So the "Speed Merchants" will manufacture their own juice between Boston and the outskirts of New York City. There the third-rail shoes will pick up the juice from a powerhouse and the train will skim into the tunnel and terminal with its diesels shut off.

The real engineering comes in the way it will be done. Virtually all of today's diesels rev their engines up and down to raise and lower current output, and this is the main speed control of the traction motors. Such a system plainly wouldn't work with the "Speed Merchants": the moment the third-rail shoes hit the high-current 600-volt rail, the whole train would go careening into the tunnel at top speed.

This means that the new train will have to have the same type of controllers that are used on all-electric locomotives. These are switching mechanisms that feed to the traction motors only as much juice as they need for various speeds. Outside third-rail territory, Fairbanks-Morse has elected to stay with this control system, rather than go back to varying diesel speed.

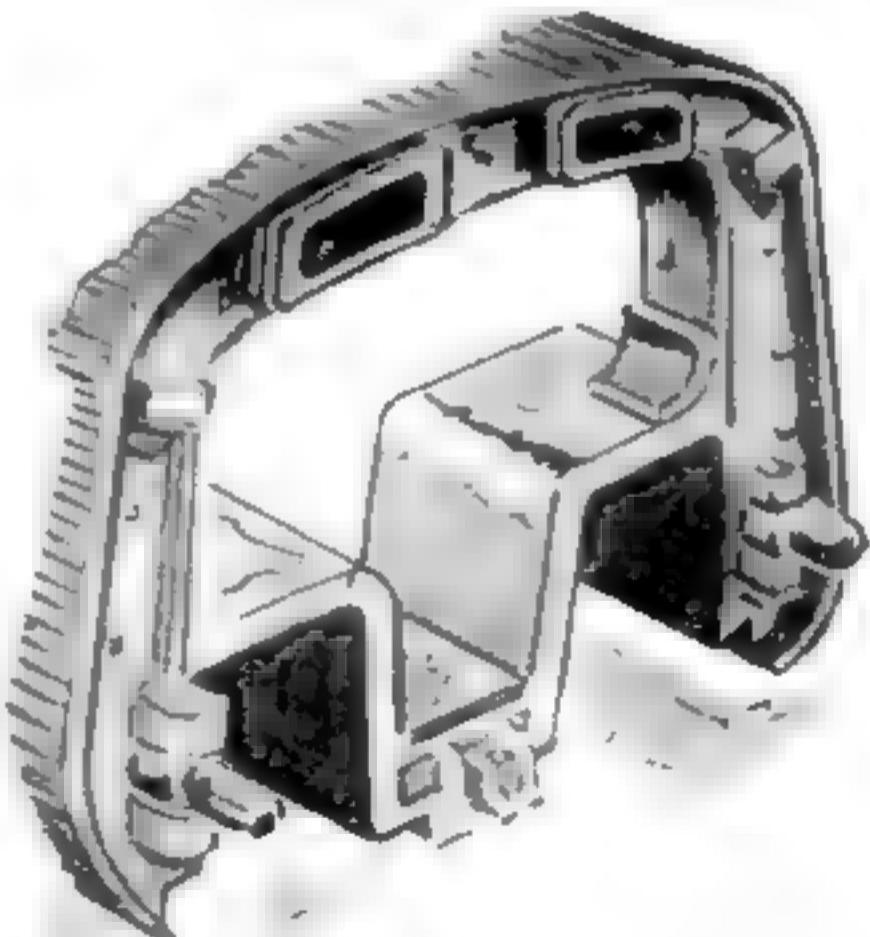
Actually, the big diesels pack so much power in relation to the Talgo train's

weight that there's no need to force them beyond a steady 850 r.p.m. Holding them at that constant speed will provide another advantage. They have to supply the coaches with AC power. Since AC generators call for constant speed, with this setup they'll get it.

Change-over. Let's see what will happen as a "Speed Merchant" crosses from diesel to third-rail territory. As the third-rail shoes take over, the big engine and its large direct-coupled generator stop. At the same time, a clutch releases two other generators from the diesel's power train. One is the AC job that supplies the coach equipment. The other is a DC generator that normally supplies juice for locomotive auxiliaries—blowers, fans and air compressors.

Now watch closely. At the instant of change-over, this DC generator stops being a generator and becomes a motor, keeping the AC generator twirling. As one of the Talgo's 400 passengers, you'll still get your heat, light and air-conditioning at the same old stand. The reason the DC generator can be spared for its new assignment, of course, is that the third rail is now supplying power for the locomotive auxiliaries.

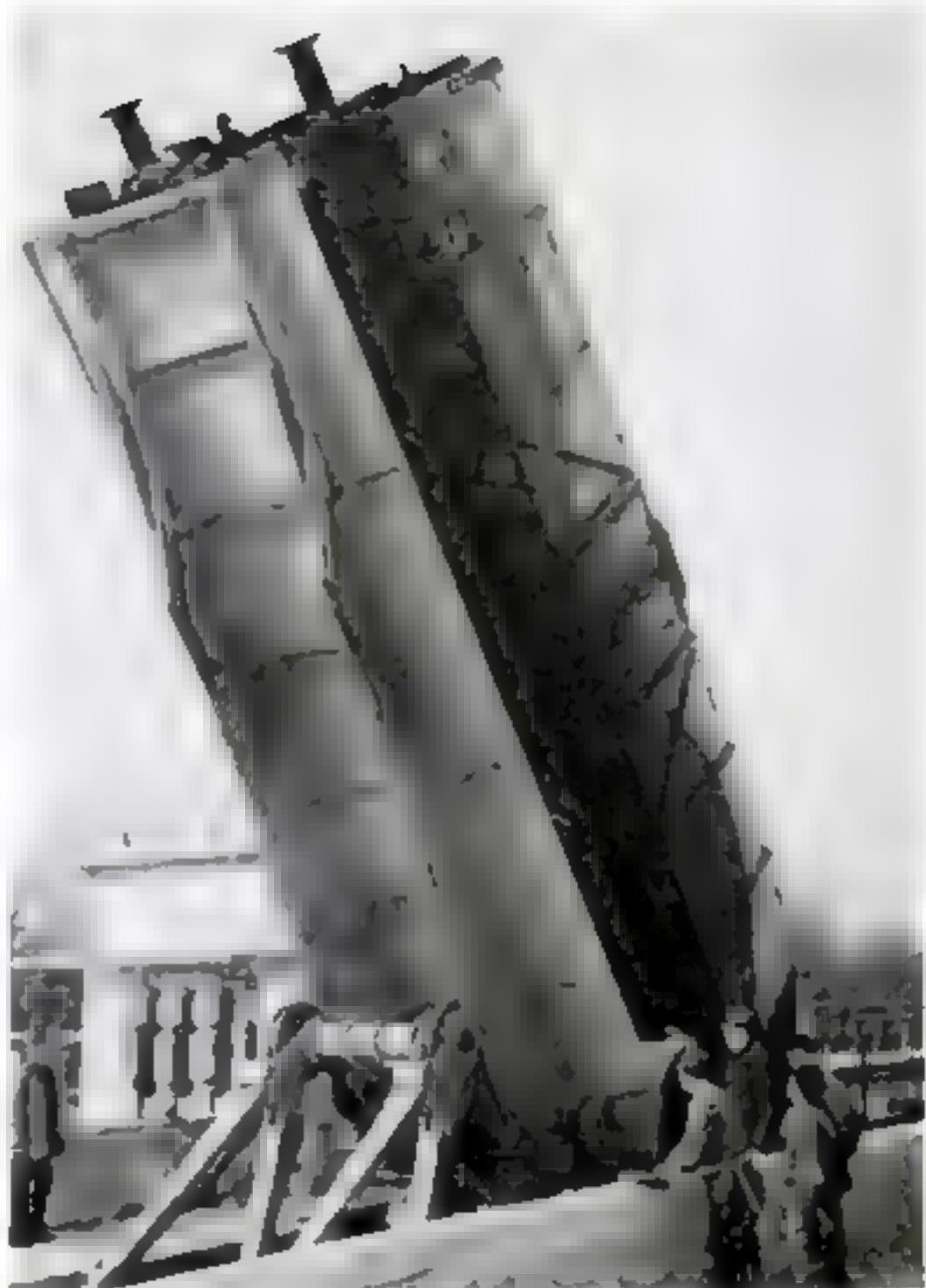
[Continued on page 270]



INTERMEDIATE BULKHEAD of a three-car Talgo coach has studs on sides to align adjacent bulkhead. Pockets below studs let wheels "steer."

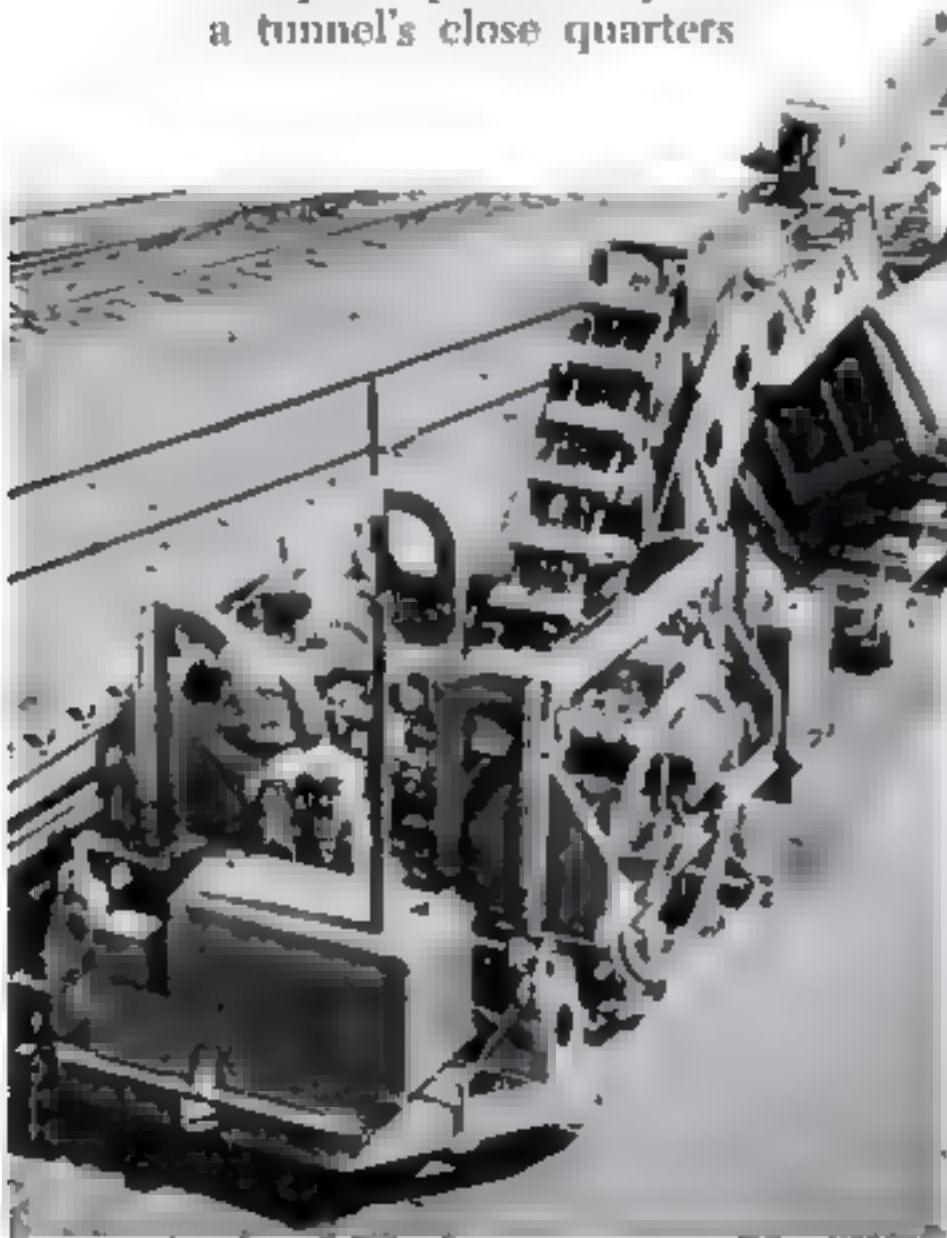
Upsy-Daisy. Unloading coal from heavy freight cars is light work for employees at this West Berlin gas plant. Backed onto the hinged platform of a specially designed hoist (right), a gondola is suspended and dumps its 40-ton load in a matter of seconds. Flanged wheels on a moving frame engage the odd-shaped profile of the platform girders to tilt the car upright at increasing angles.

One-Man Scoop. Called the only one of its kind, a new mechanical scoop removes old ballast and replaces it with new along the Southern Pacific tracks in the High Sierra. Its cutters loosen worn ballast, scoop it into conveyor buckets which carry it to two hopper cars. On a second trip, new ballast is dumped from the hoppers on the roadbed. The scooper is particularly useful in a tunnel's close quarters



Working on the Railroad

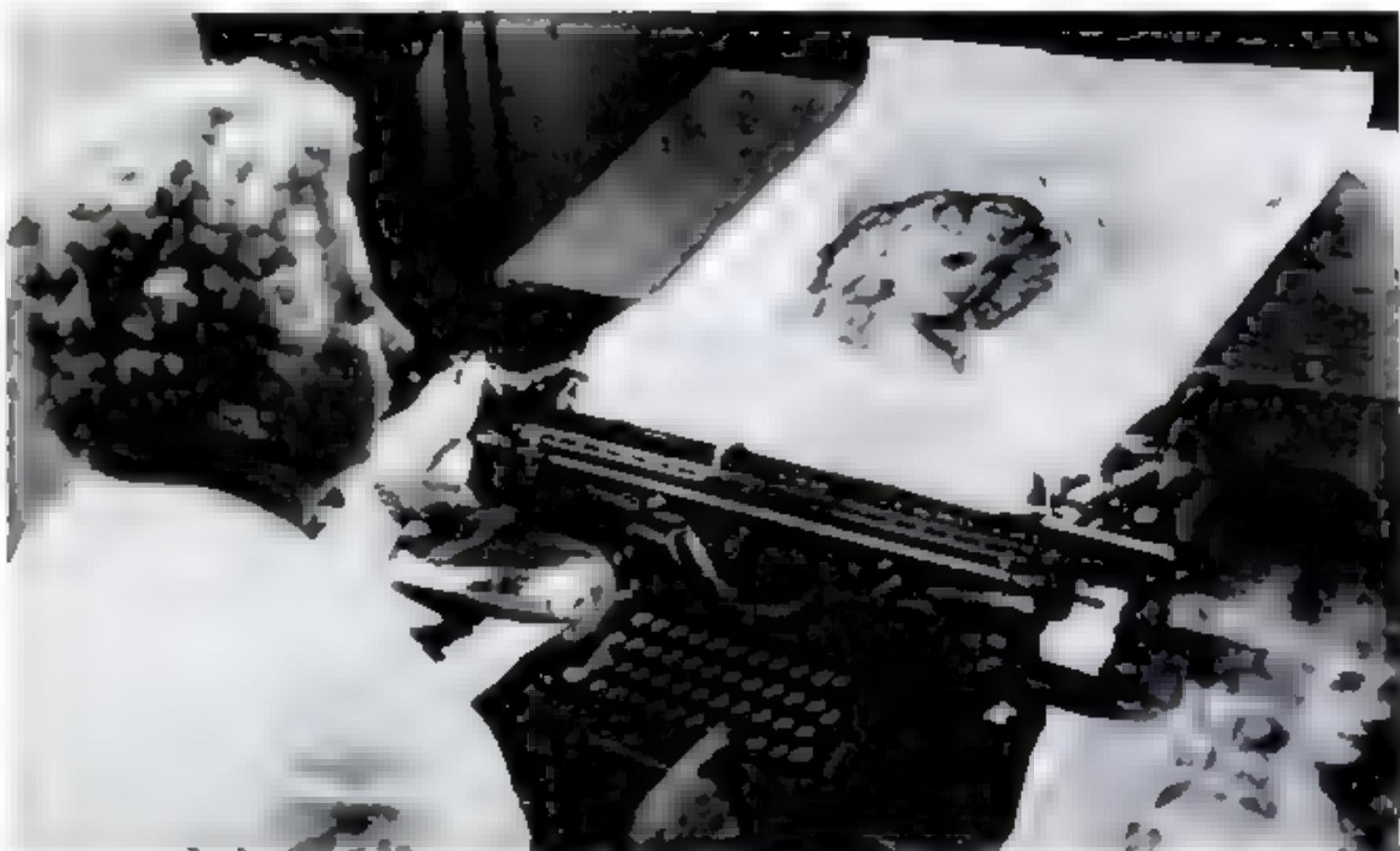
'Tween-Car Hauling. Too deep for flatcars, trusses for Philadelphia's Walt Whitman Bridge are rigged between them on swivel-plate couplings at Bethlehem Steel's Pottstown works. Flexible hose connects the air brakes.





Germans Light Up Cop and Excursion Boat

TRAFFIC directions by the white-garbed policeman under a fluorescent-light canopy (left) are distinctly seen by Munich's nighttime drivers, while 421



One-Finger Typist Copies Art on a Standard Keyboard

HER only concessions to art are a long carriage and a multicolored ribbon when Dona Alberich of Barcelona "paints"

with her typewriter. Using standard keyboard characters, she is copying Gainsborough's "Duchess of Devonshire."



fluorescent tubes convert the motorship *Seeshaupt* into a vivid tourist attraction on nearby Lake Starnberg. The 1,200-passenger excursion boat, powered by

two 350-hp. diesels, is lighted inside and out by fluorescent lamps, and is also heated by electricity. It is operated by the German Federal Railway.



Compressed Air Controls Plows

A PNEUMATIC lift in the tubular spine of this new British tractor regulates depth of its front-mounted implements. The air compressor, driven by a diesel in the rear, will also inflate the tires.

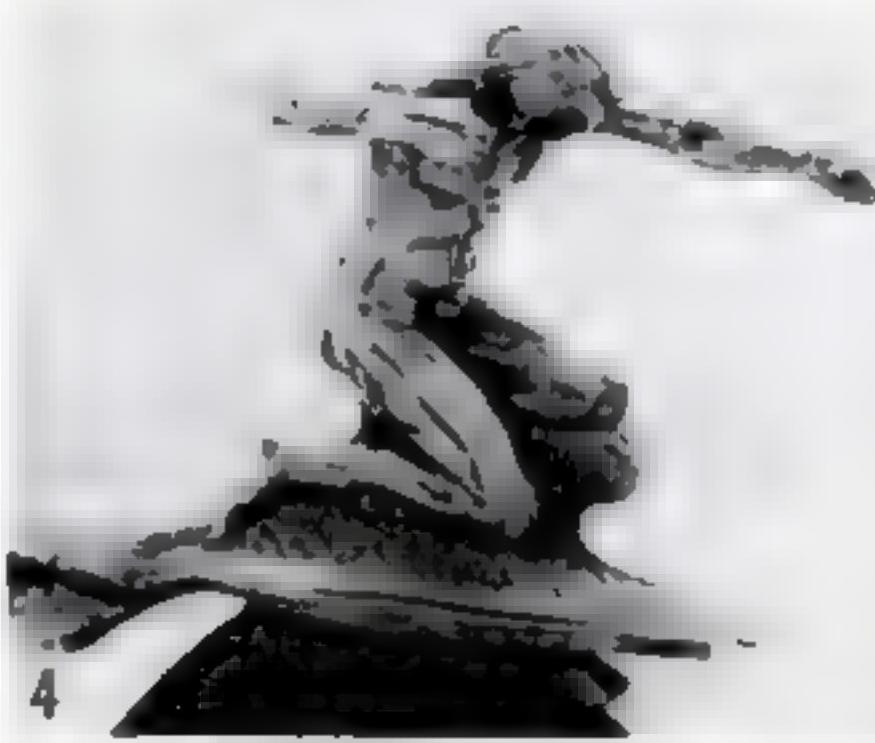
Sea-Dozer Herds Floating Logs

THE little boom boat at right, powered by a 15-hp. outboard mounted in a center well, was built by the Weyerhaeuser Timber Company to doze logs into its sawmill slip near Enumclaw, Wash.





**What famous cars
wore these figures
on their radiators?
(Check your answers
at bottom of page.)**

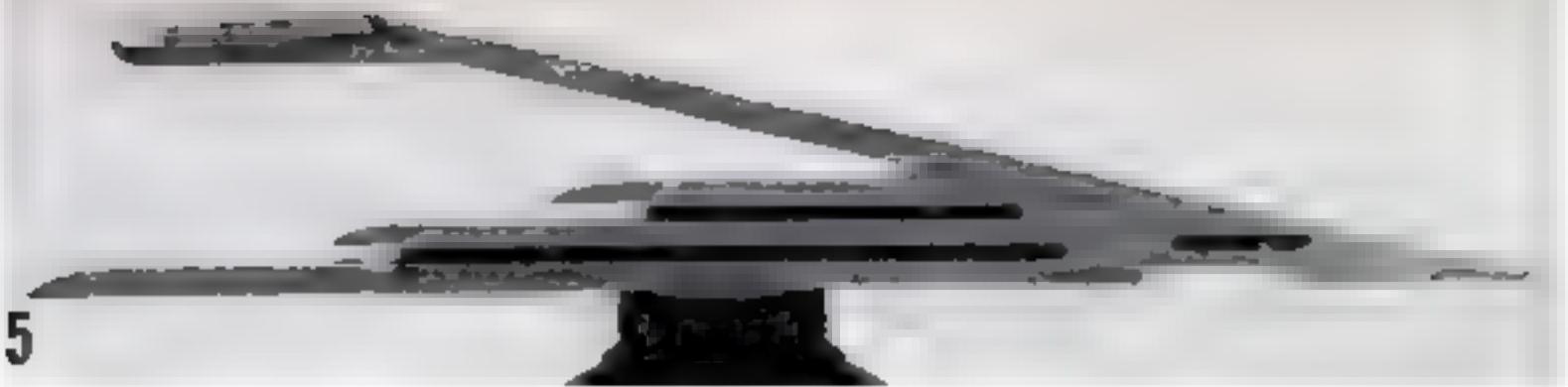


He makes mascots for



THANKS to the fast-growing fraternity of classic-car fans—car collectors who feel that no really fine automobile was manufactured before 1925 nor after 1942—business is booming for Don Clairemonte, a New York City sculptor, who is shown at left hard at it.

Clairemonte's business is supplying the owners of Cords, Duesenbergs, Stutzes and other classics with authentic replicas of missing radiator ornaments. A classic-car fan himself and proud owner of a well restored '33 Chrysler Imperial, he can turn out a chrome-plated bronze copy of just about any classic radiator ornament—the fans call them "mascots"



5



6



7



8



9

over-age automobiles

—from an Isotta Fraschini winged man for \$65 to an Auburn girl for \$15.

The mascots pictured above are from Clairemonte's collection of originals, which he uses as patterns.

Clairemonte also creates personal mascots for those who want something individual perched upon their car's radiator. These he first models in wax or clay and then casts in bronze.

Two Clairemonte originals are shown at right: his charging lion for the Inskip line of imported cars; and the emblem of the Classic Car Club of America. Into that one design he worked features of 17 different classic cars, from Franklin trunk to Wills Ste. Claire flying goose on the radiator.—George H. Waltz Jr.



Clairemonte's lion symbolizes British cars.



British Tractor Plows Field Without Driver

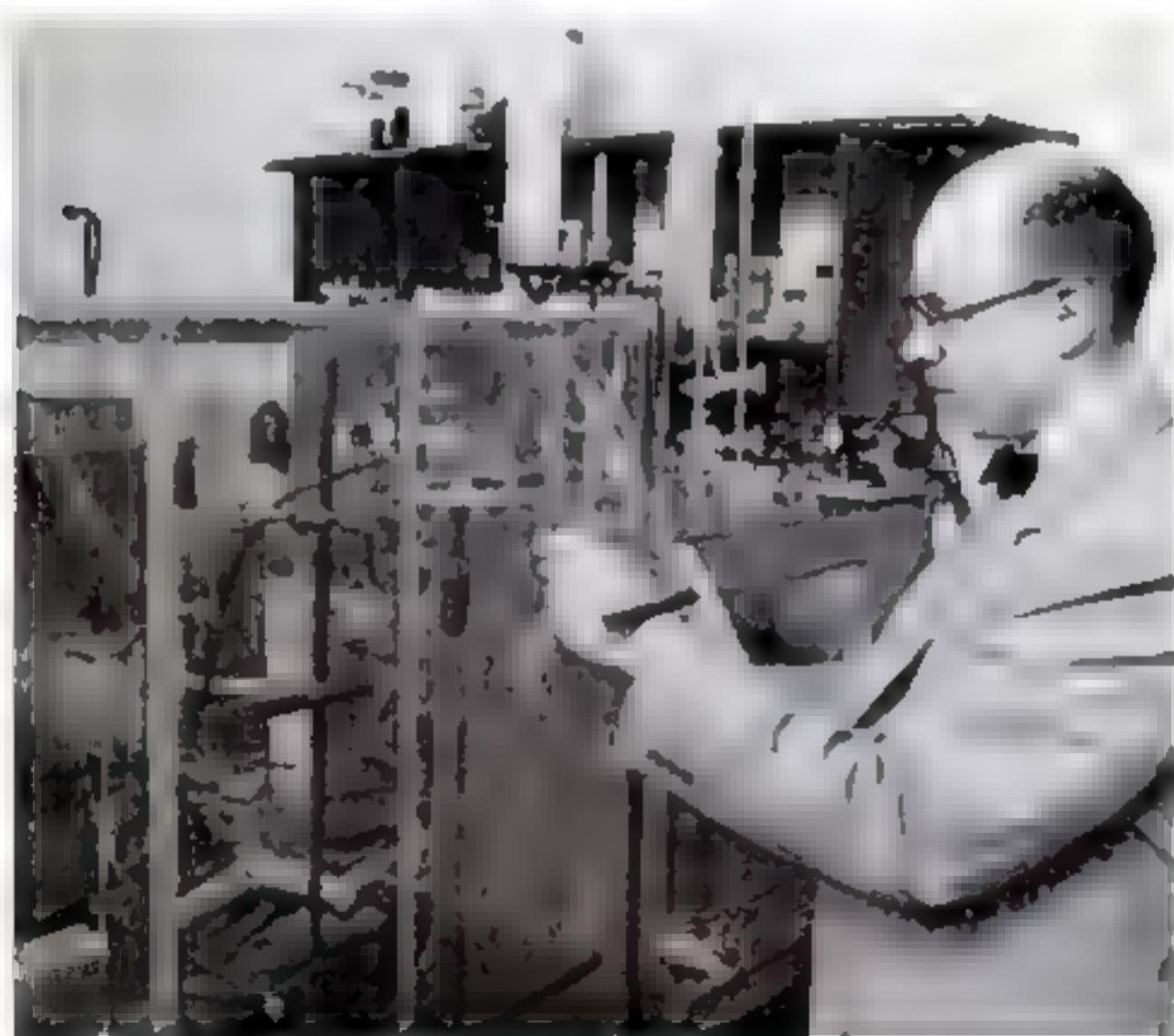
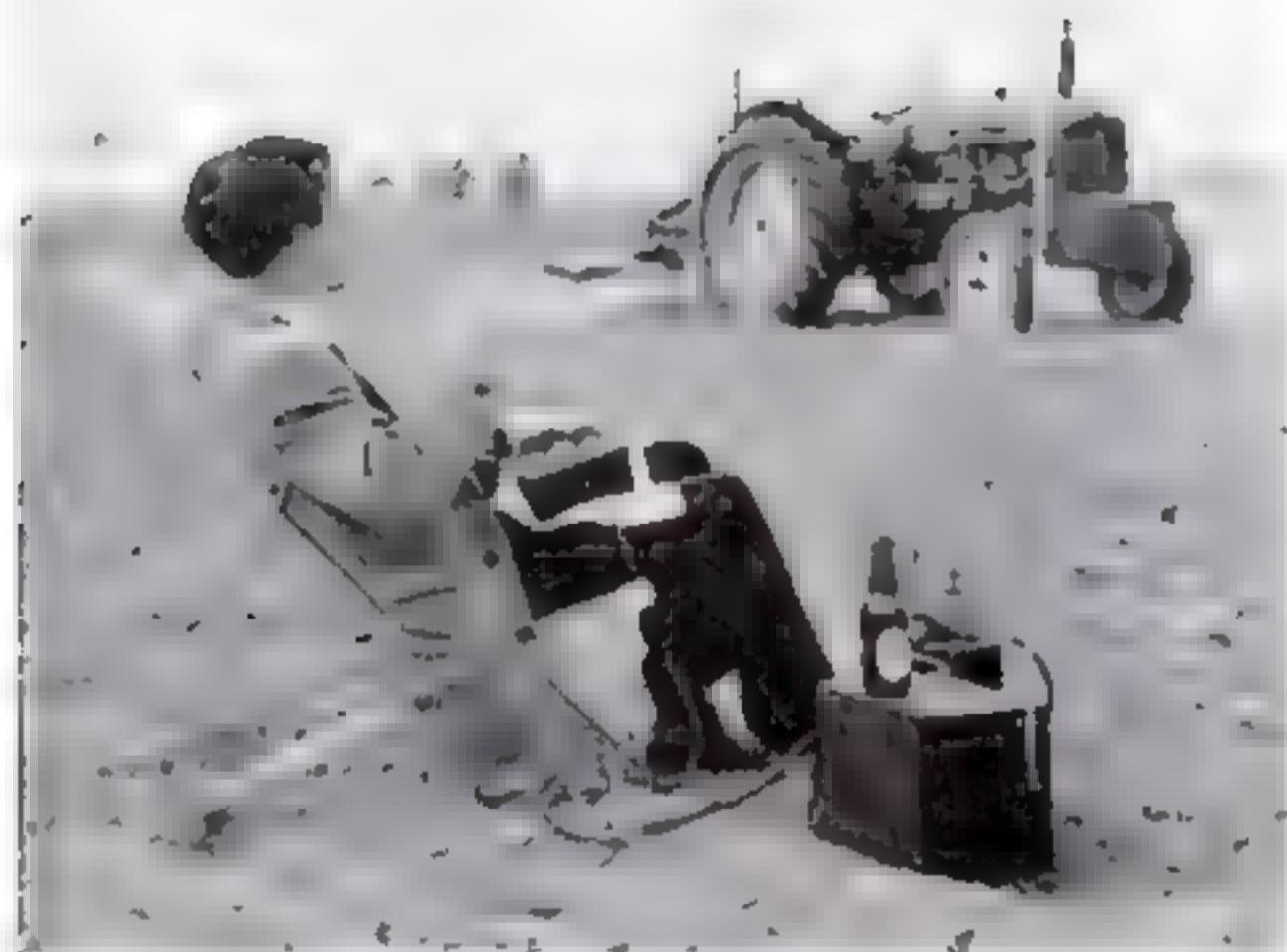
A FARMER could hang up his overalls and sit at ease while this tractor moved around the field, plowing expertly. After it has been started by hand, radio controls operate the clutch and engine cutoff, steer the tractor and raise and lower the plow.

Purely experimental, it was built for the British Ford company. The designers point out that the technique has many other possible uses—for instance, taking fire-fighting equipment into the heart of a fire without endangering the life of a driver.

How's the Air? This Electrical Nose Knows

HERE'S an electrical nose that can sniff out tainted air when the contamination is only one part in 20 million.

The work of J. R. Eaton, C. R. Chapman and J. O. Kopplin of Purdue University, it detects odor by measuring the changes in electrical characteristics that contaminations produce on the surfaces of particular test materials.





Forward "eyebrow" slats and big flaps give the Helioplane extra lift for low-speed flying.

Flying the World's Slowest Airplane

***You can drop below the weather
and still maneuver safely, for a
lazy 30-m.p.h. hedgehop home.***

By Herbert O. Johansen

WE WERE flying 150 miles an hour at 6,000 feet in a single-engine lightplane. I was telling my companion at the controls how fast I had flown in a B-57 twin-jet bomber. "That's pretty fast," he said. "But



SHORT TAKE-OFF and steep climb of the Courier obviate need for a long field or a fast run. The car here started even with the plane and is actually traveling faster at this point.

Helio tail and wings give stability and maneuverability at low speed



MANEUVERABILITY AT LOW SPEEDS is made possible by the strips of metal seen projecting behind the leading-edge eyebrow slats. They block the air flow through the slot and immediately reduce the lift of the wing. This results in dropping that wing, giving the same effect that an aileron would at high speed. These interceptors are operated by the aileron controls. By themselves, ailerons give an opposite effect when used at low flying speeds.

now tell me—how slow have you flown?"

"How slow? I don't know. Guess I never gave that much thought."

"You should. In a lightplane it might mean your life," said Dudley V. Talcott, sportsman-pilot of Farmington, Conn., and owner of the first production model of the Helio Courier in which he was giving me a ride.

We had been slowing down gradually. As the indicator needle slumped to 50 m.p.h., Talcott told me to watch the leading edge of the wings. I did. There was a sharp bang, and I saw two curved slats pop out on each wing.

"Those are the 'eyebrow' slats," he explained. "They are popped out automatically by aerodynamic pressure at low speeds."

The needle had gone below 40 and was nudging 35 m.p.h.

"We're going to stall," I said. In fact, by all my past experience in planes, we should have stalled many miles-an-hour back.

"Not in the Helio," said Talcott comfortingly. "The leading-edge slats smooth

out the air flow so that I can keep the nose up. And those big flaps I've got all the way down are doubling the lift of the wings."

We went poking along, straight and level. Cars on a highway below were running away from us.

"Now that you've seen stability and low speed, let's try some maneuvering."

What I wanted right then was a parachute. You're not supposed to have that kind of control in a plane just crawling through the air.

In the Helio you have, Talcott lifted the left wing and we went over in a steep bank and into a tight turn. Speed was below 35 m.p.h.

"No stall, no spin—safe and smooth as a sea gull," my companion noted as we leveled out again and headed back for

/ Big prop on small plane makes Courier a fast climber



Oversize propeller, 101 inches long, makes possible short take-off, fast climb. Landing gear, placed far forward, prevents nose-overs in mud, deep snow or on rough ground.

the small airport. We touched ground gently, leisurely. I could have climbed out and walked off while we were still rolling, before we came to a stop within about four plane lengths.

In the airport coffee shack we discussed some of the features of the Courier with Dr. Lynn L. Bollinger, president of Helio Aircraft Corp., Norwood, Mass. He told me that Dr. Otto C. Koppen, Professor of Aircraft Design at Massachusetts Institute of Technology, was responsible for its basic design engineering. That the plane does not need speed to stay in the air is the result of a combination of devices, the most important of which are shown in the accompanying photographs.

"Why does anybody want to fly so slowly?" I asked Dr. Bollinger.

"**For safety**, especially in bad weather," he explained. "Because you can fly slow, you can fly low—under the weather. In an emergency, you have time to look around for any level spot to land. In case any obstacle, such as a mountain or TV tower should suddenly loom ahead, you can turn on a dime and go the other way. And if you do have to come down, the Helio has a rate of descent less than that of a parachute. You can put it down almost any place that has a few hundred feet of clearance."

Physically, the Helio Courier looks much like any other sturdy lightplane. A four-place job, it is powered by a 260-horsepower geared Lycoming engine. It is 30 feet long, has a 39-foot wing span, and has a range of more than 600 miles with 60 gallons of gas. The price is \$24,500.

The fact that it can take off and land in short distances, making any yard, golf course or meadow an airport, is secondary, said Dr. Bollinger. Safety and ease of handling in the air at low speeds, by even inexperienced pilots, is the primary consideration.

"Just what was our take-off distance this morning?" I asked Mr. Talcott.

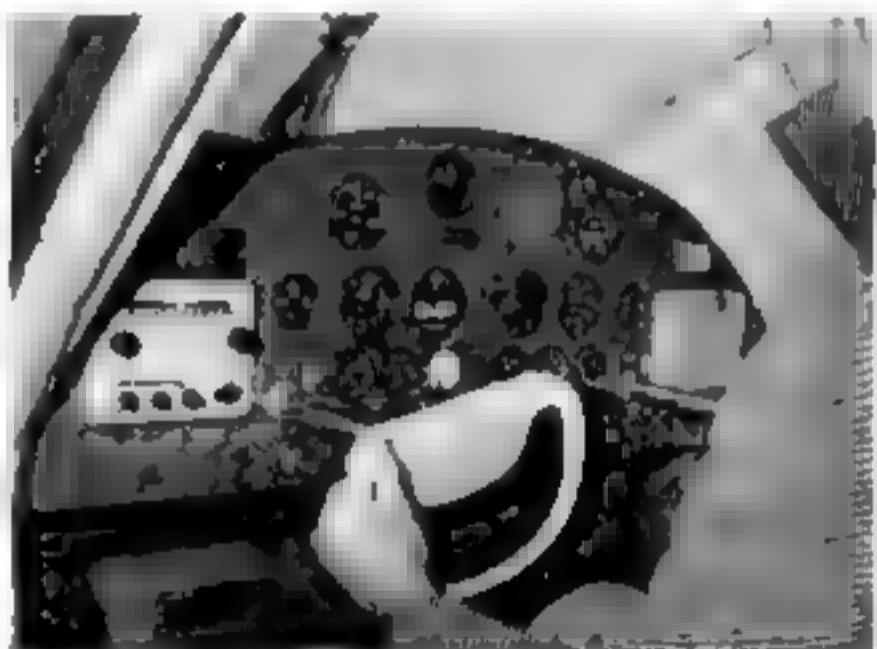
"Oh, about 200 feet. In fact, a football field would make a fine airport for the Helio."

END

**Tail stability,
cabin strength,
seat safety**



TAIL ASSEMBLY is big. The vertical stabilizer, rising more than 8½ feet above the ground, prevents rear-end sway when the airplane is flying slowly. Length of the plane: 30 feet.



STEEL TUBING (above) over the windshield is part of the Courier's extra-strong cabin structure. The quick-release seat harness (below) is the new Griswold type, which straps across the waist and over the shoulder. It will keep the pilot's and the passengers' heads from being thrown forward in the event of a crash.





Mechanized Loader Replaces Fork, Moves Fodder Faster

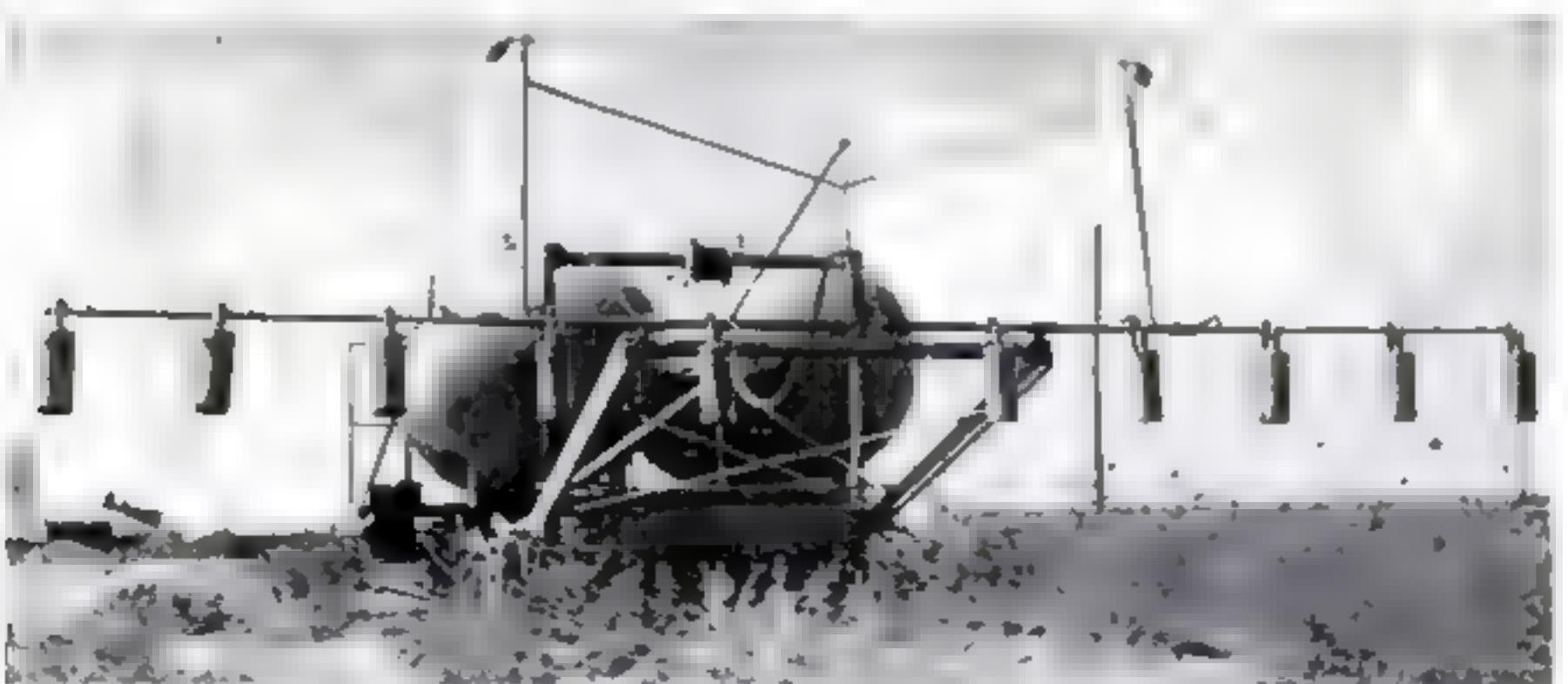
Dicing and loading are one operation with this new farm machine designed to move silage. Making clean cuts in the face of trenched stock feed,

it loads fodder over a conveyor belt at 2,000 pounds a minute. Oswalt Industries, Garden City, Kan., makes it; a power take-off from a truck runs the belt.

Flame Thrower Clears Weeds from Railroad Right-of-Way

THE weird contraption below will ride the Santa Fe's rails, cutting a weed-killing, 16-foot fiery swath. In winter, its 10 tongues of flame, six to 12 feet long,

will de-ice car retarders and switches. The heat burns soft ties which should be replaced, and draws creosote to the surface of good ones, preserving them.





Local traffic in Hobart, Okla., has room for leisurely maneuvers on its wide-open streets.

This Town Has Never Had a Traffic Death

By **Gilbert Hill**

HERE is a town in Oklahoma that hasn't had a traffic death in its 55-year existence, which corresponds approximately with the existence of the automobile. It's the only community in the United States with a population of more than 5,000 that can make that claim. How Hobart has managed the miracle against a dismal backdrop of ever-increasing fatal automobile accidents everywhere else is a lesson in everyday alertness and care.

Hobart folk help out by telephoning the police department several times a day. "There's a speeder," they say, "and the license number is—" Or a citizen will report a driver who seems to be drunk, or one driving carelessly.

Yet arrests for traffic violations average only four a week. The controls on driving aren't imposed by handing out tickets. A cop simply makes a call on the offender and talks things over.

"We're not interested in arrests," says Doss Kutch, the chief of police. "We just don't want anyone killed."

Kutch would have a tough time polic-

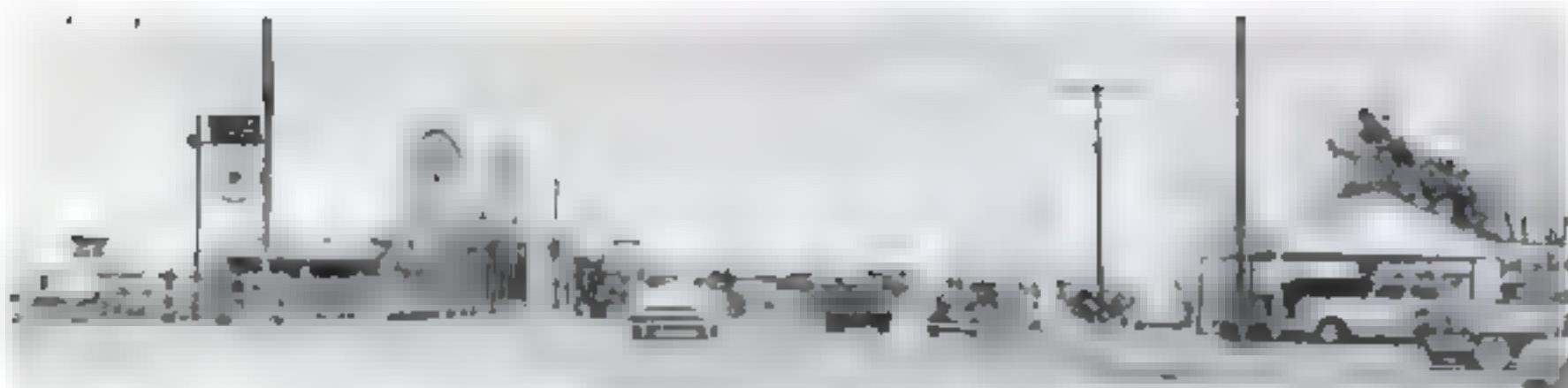
ing motorists if he didn't get citizen cooperation. His entire force, including himself, numbers only five men.

An unusual ordinance helps, too. Chief Kutch can correct any traffic hazard on the spot. He can put up a stop sign on his own authority. He can order a property owner to remove or cut back shrubs. He can make a businessman pull down a sign obstructing a motorist's view.

Chief Kutch spends hours on safety education. He talks with school children and to parent-teachers and other groups. If there is a child in Hobart who doesn't know that a car's stopping distance shoots up as the square of its speed, he hasn't been listening.

Precaution is constant. Finis Gillespie, city attorney, heads a Kiwanis Club committee which pays school janitors for special traffic duties and teams up with the Rotary Club and the city to buy uniforms, whistles and badges for these extra-duty "policemen."

Hobart's street layout also contributes to its safety record. The community got its first traffic break in 1901, when hordes of land-hungry settlers poured in to draw lots for tracts of land that



Through traffic in Hobart, steered around the business district, scoots safely by at 60 m.p.h. once belonged to the Kiowa Indians.

The townsite was surveyed by Government men, and they had the wide-open spaces to dabble with. As a result, streets are straight and wide. Intersections are open. There are no blind corners. Traffic directional signals abound.

And—a bit of good luck—Hobart is almost completely bypassed by the only major highway directly serving it. State Highway 9 cuts through the city limits for only about three blocks on the south side of town. No trailer trucks rumble the length of Main Street. No tourists fret their way through stop lights.

Posted speeds are about normal. In residential areas, it's 25 miles an hour, downtown it's 20 and in school zones 15. They aren't enforced to the letter.

"With modern cars," explains Chief Kutch, "a few miles above those limits may be safer than when the speed limits were set years ago, but they're there if we need them to prove reckless driving."

It would be pleasant to report that Hobart's happy situation, especially with respect to the bypass, was the result of single-minded, community-wide planning. It wasn't.

In the late 1920s and early '30s, the town fought for one of the "big roads" being built by a nation suddenly become highway-conscious. Hobart was irritated when the east-west U.S. 66 was built miles to the north. It grumbled when north-south U.S. 183 was laid down a tantalizing two miles to the east.

Hobart almost succeeded in getting State Highway 9 right through town, past the schools and children's playgrounds. Then a hassle developed over the cost of bridging some creeks. Some people really got their dander up when

the highway engineers decided to go around the town.

Then City Attorney Gillespie's father, a road builder himself, and some of his friends stepped in. They were politically shrewd. They also had a crystal ball. Before anyone could do anything contrary about it, they had made a deal with the state. A spur would be built into Hobart from a junction of two main highways, and State Highway 9 would touch the city limits.

That was close enough. Hobart probably was the first community of its size to have a bypass route.

It was shortly afterward that Hobart discovered that it had been left off the official state highway map—no major highway bisected it. A million maps had to be destroyed and new ones made.

Now, 17 years later, the city finds that Highway 9 was built too close. Traffic on that fringe is a problem. Typically, Hobart has declined to erect stop signs on the highway. Instead, it enjoins its own citizens to be careful. Stop signs are put on all city streets crossing the highway.

Negotiations are in progress to slow the traffic as it streaks through.

Hobart recognizes a basic problem in safety. The good roads committee of the chamber of commerce adopted a resolution three years ago calling upon the state highway commission to "bypass through traffic around business areas of our cities, and particularly away from schools wherever possible, as a means of reducing the death toll in our state."

Hobart is still left off some road maps not printed in Oklahoma. But the sting is gone; Hobart is famous enough. It's the safest city in the U. S.

END



Roaring oil fire . . .

... by automatic sprinkler

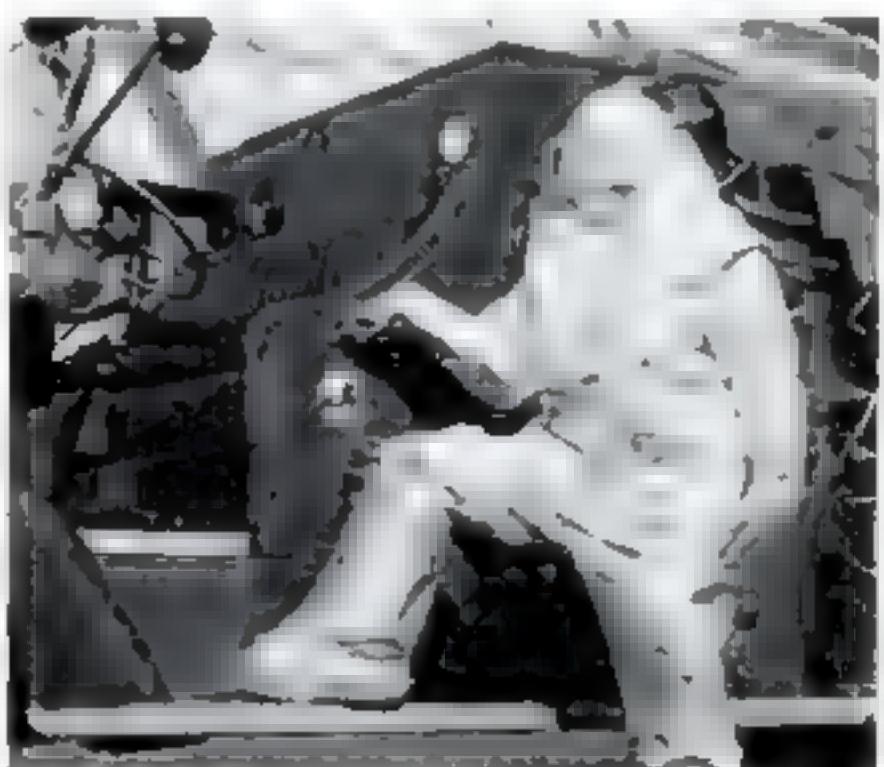
"Bird Cage" Smothers Fuel-Tank Blaze in 6½ Seconds

A FLOATING spinner, with nozzles rotating in opposite directions, has been developed in England to put out fires in oil-storage tanks almost as soon as they

start. Heat sets off the action and a spray of fire-fighting chemicals, chlorobromomethane and methyl bromide. They smothered the flame above in 6½ seconds.

Man In Aluminized Suit Can Wade Through Fire

READY to plunge into a blaze, if that is necessary to help put it out, this fireman at the Convair plant in San Diego is wearing a suit of Fyre Armor. The outfit is woven of fire-resistant fabrics, coated with aluminum foil, and weighs only about 10 pounds. It contains no insulation. It is said to reflect more than 95 percent of radiant heat and never to get hotter inside than 108 degrees. For safety's sake, though, the wearer must keep moving through the blaze.



'It' Builds 2½ Engines A Minute

Men feed in the metal and push buttons in the world's newest and biggest auto engine plant.

By J. George Janes

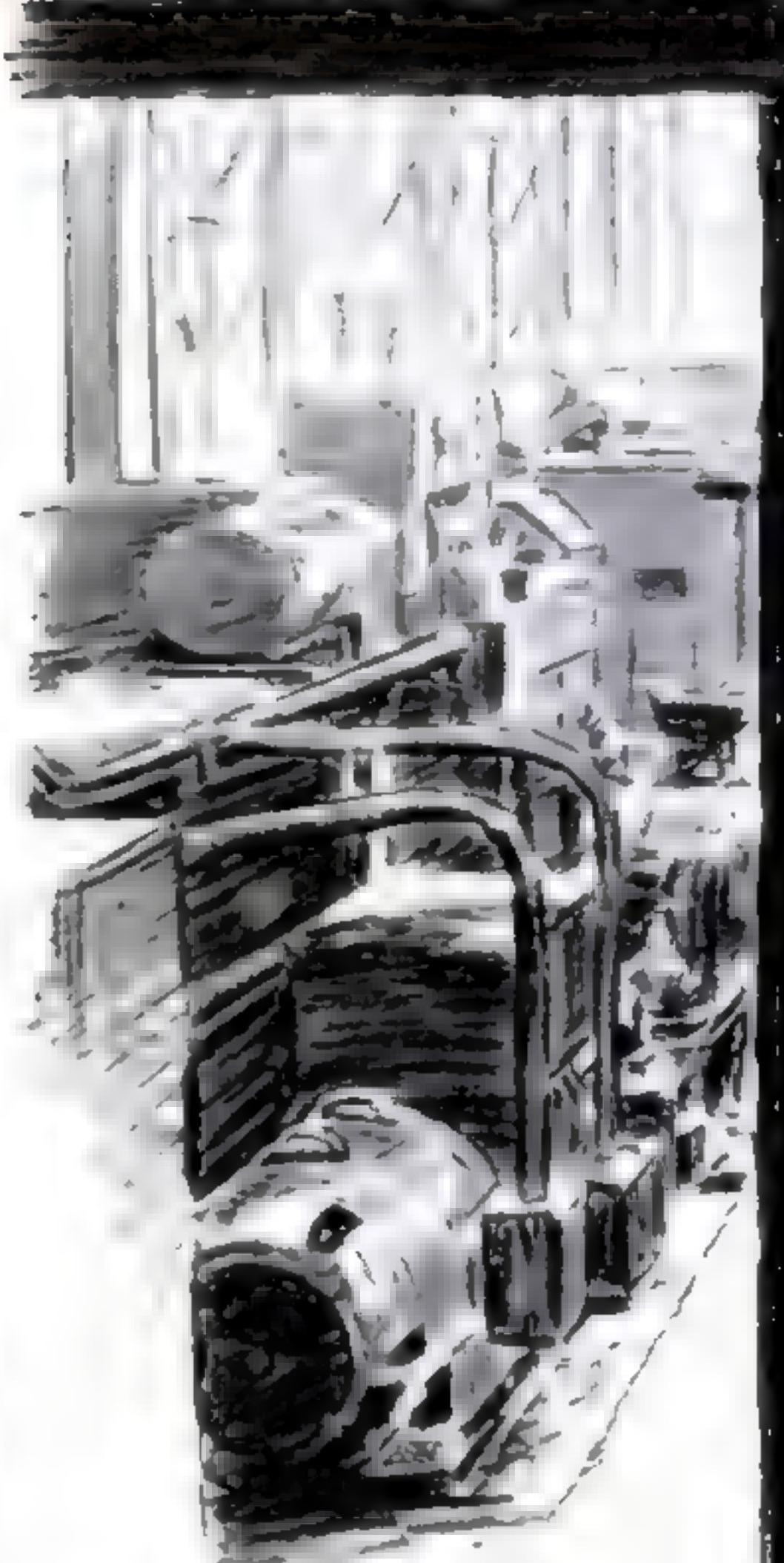
DRAWINGS BY THE AUTHOR

THREE'S a place in Detroit where a workman puts a big hunk of metal in a machine, and practically by the time he has scratched his chin and yawned, the hunk of metal has been bored, drilled and burnished to become the shell of an automobile engine.

Nearby, another fellow shoves another hunk of metal into another machine, and it emerges as a cylinder head. Still another feeds in metal to get crankshafts.

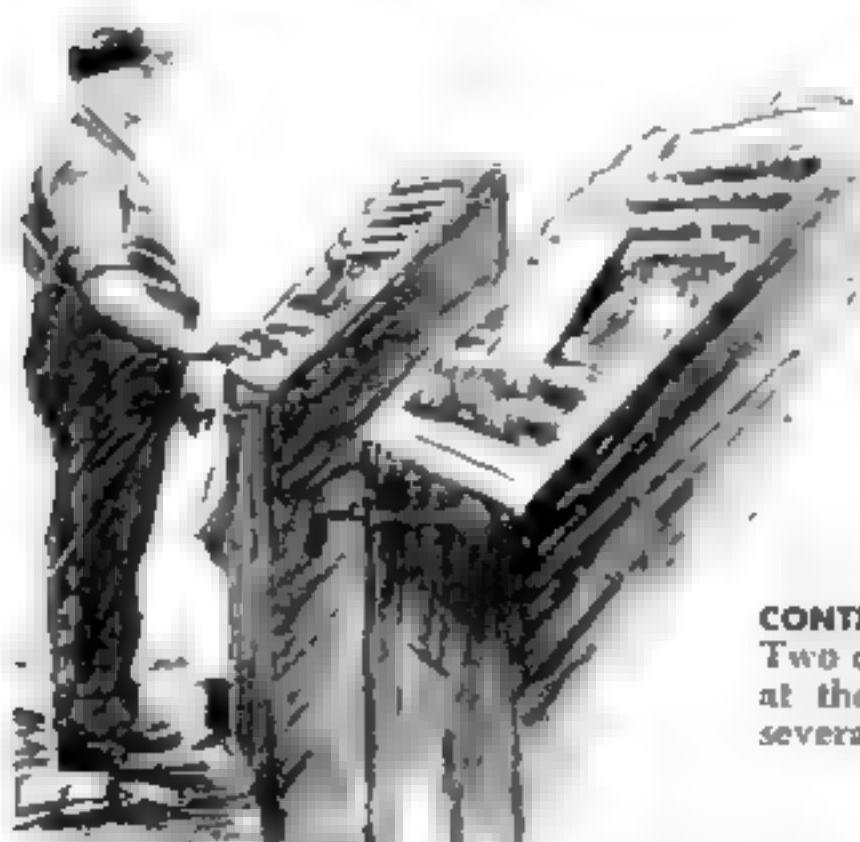
The machines do the rest, automatically. Parts keep popping out like doughnuts—at a rate of 2½ engines a minute.

The process is a mite unnerving. The

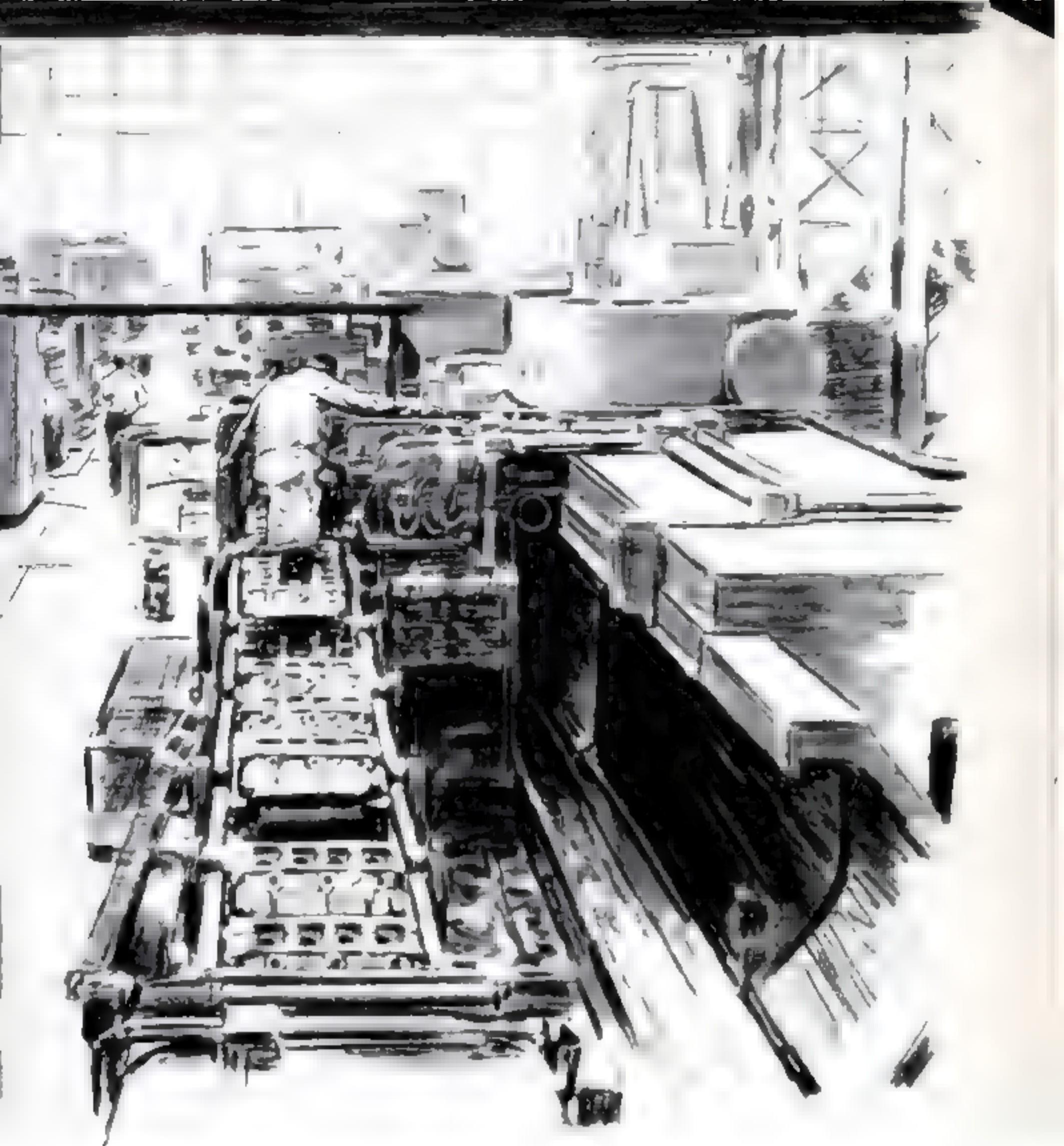


Only a sprinkling of workmen tend robots of automation

MACHINES DWARF MEN. Broacher is like a giant file, planing a V-8 Plymouth engine in one stroke. Chap in middle distance, a representative of a machine-tool company, is making final adjustments on a huge broaching tool. Among other things, a broacher is used for drilling holes that aren't round. Engine production was largely a manual operation until after World War II. Then Ford went to automation. Olds, DeSoto, Pontiac and others followed. System makes mass production of engines possible.



CONTROL PANELS govern the operations. Two of many used are shown here. The man at the push-button console remote-controls several tools that machine engine blocks.



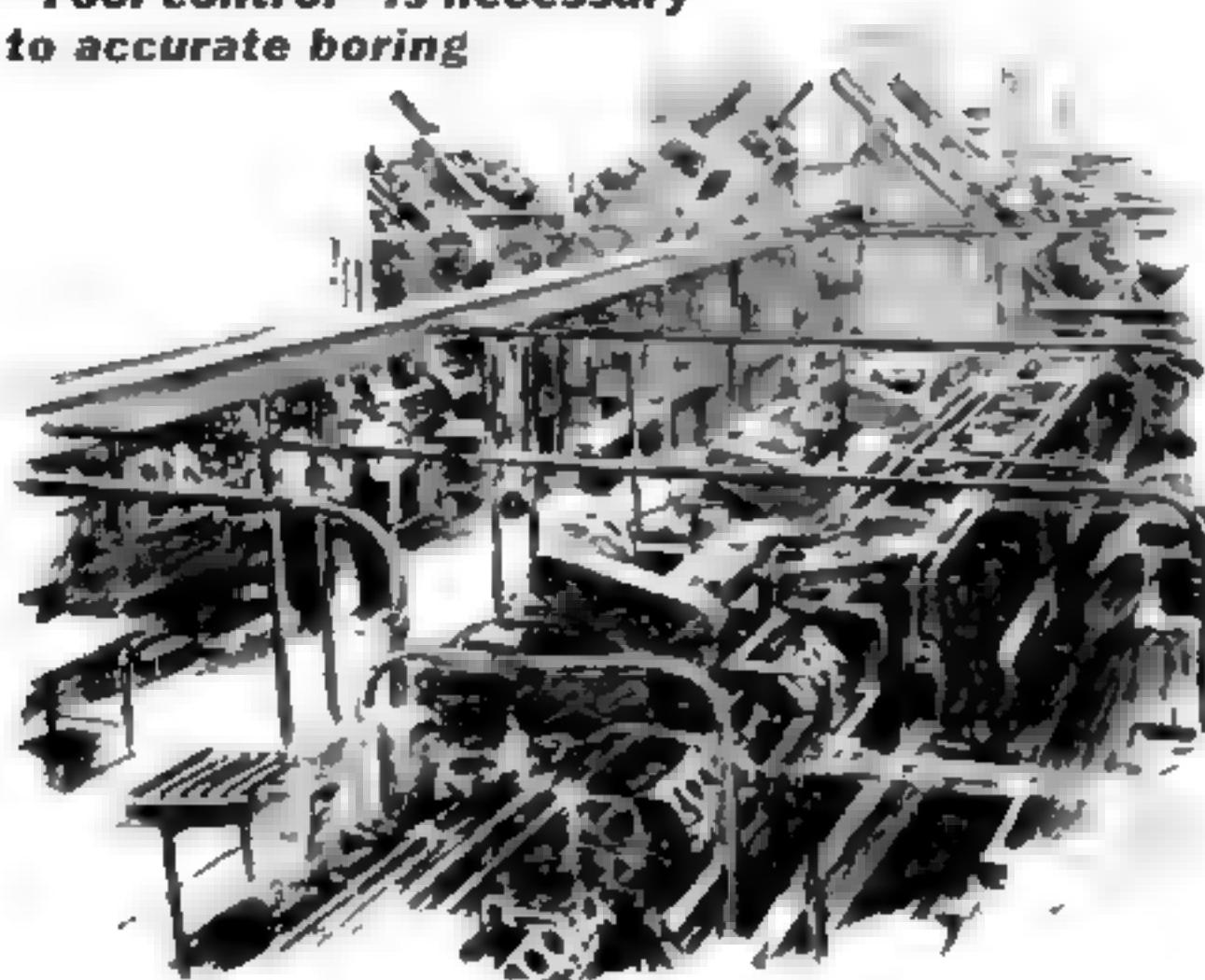
machines have a surgeon's touch, but a brute's strength. They almost think.

The hunks of metal are castings, rough pieces of congealed iron or steel. The machines finger them delicately, plane them, polish them and bore holes in them. If a machine makes a mistake—which is rare—it rejects its own work. When the machines have finished, a man steps in again to use his hand skills. He

completes the assembly of parts to fashion engines for the open road.

Pictured on these five pages is the automatic engine factory of the Plymouth Division of the Chrysler Corporation. It's the newest and biggest anywhere—an operation in automation that has cut the plant's direct labor force, yet increased the skilled maintenance workers among its 3,000 personnel.

**"Tool control" is necessary
to accurate boring**

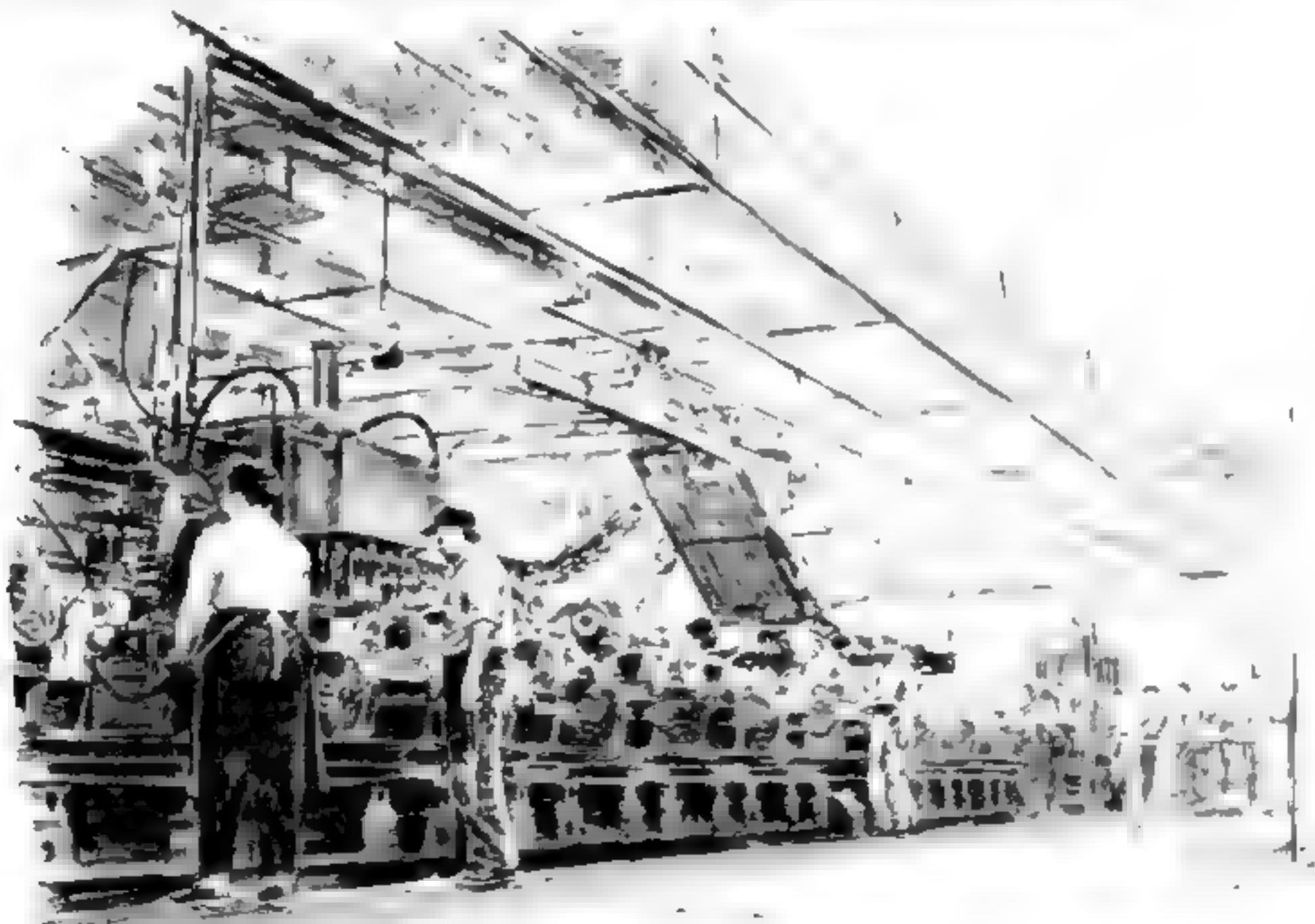


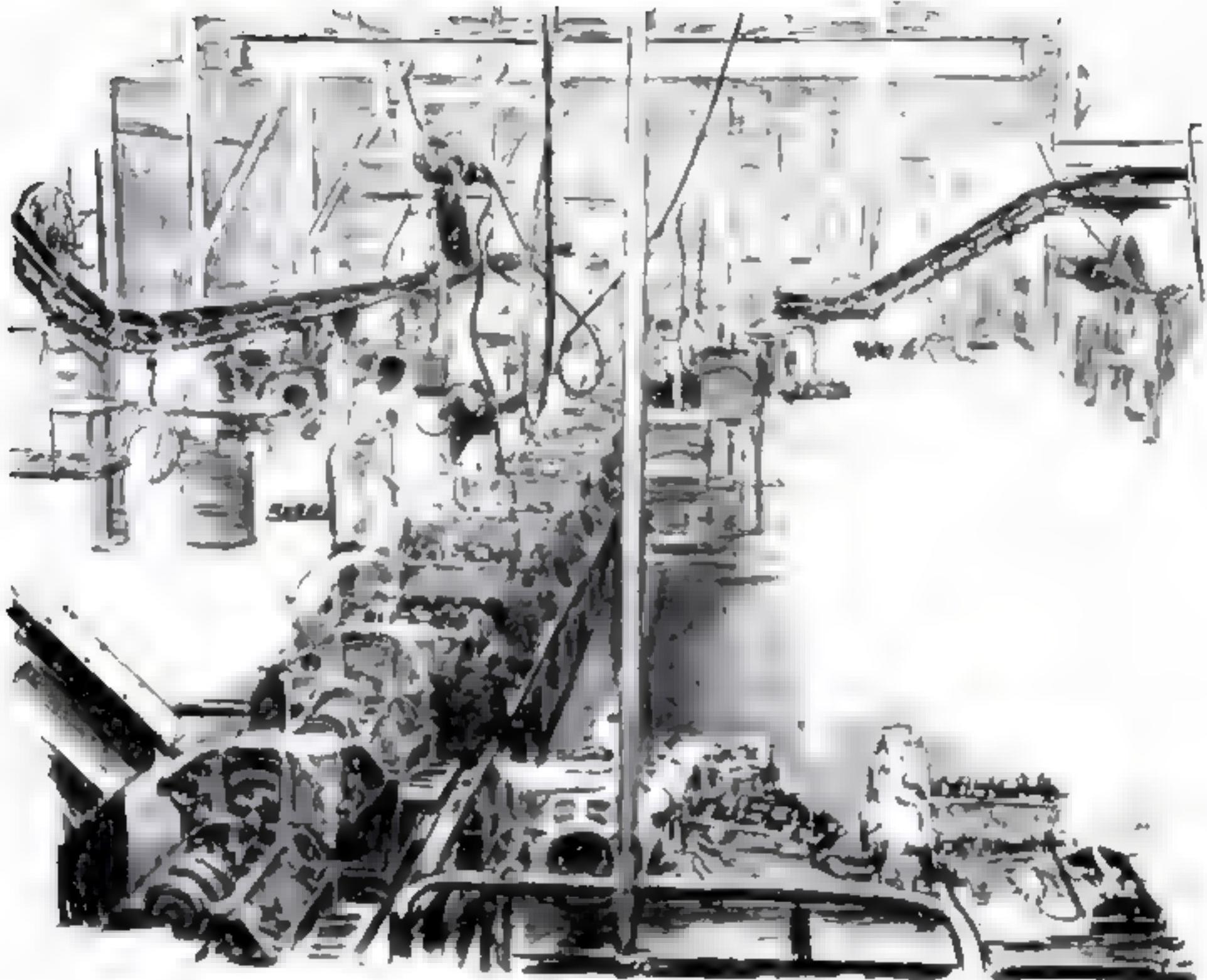
DRILLS GET DULL. So do the other tools used in the machines. Replacement must be made at proper time, and machines signal when that time comes. Workmen in the picture at left stand before a "tool-control board," which keeps a running record of which machine needs what. In foreground, automatic machines are performing a score of operations on engine blocks and other components. Blocks are moving through point called a "transfer station." In background are the impressive machines that rough-bore the cylinder holes.

Final assembly requires the dexterity of human fingers

NUMBER OF PEOPLE multiplies as engines near completion. Men at machine in foreground are

working on bearing assembly; those in distance are fitting crankshaft bearings into blocks.



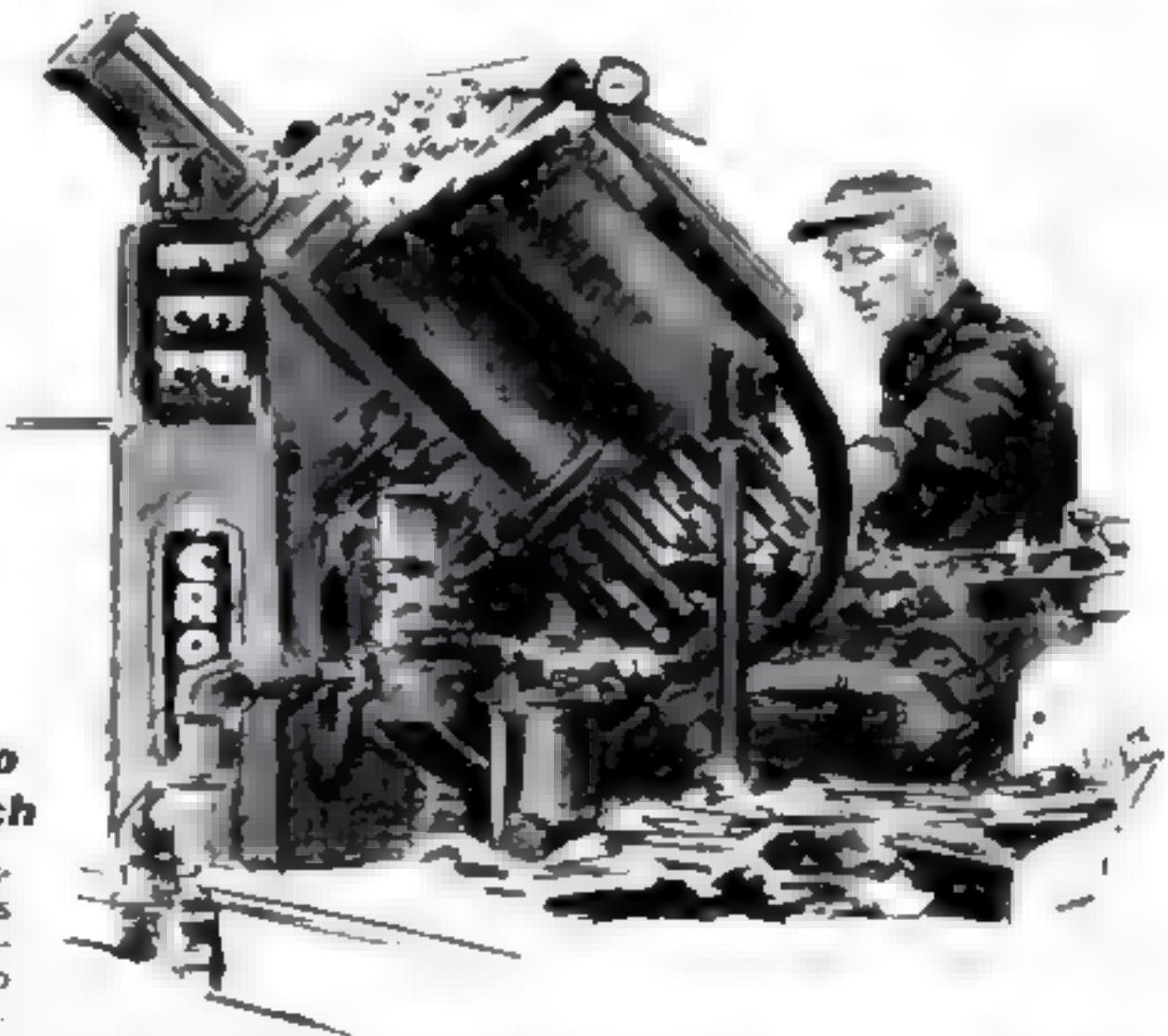


Overhead conveyors feed in parts to complete the engines

CONTINUOUS STREAM of components, like tributaries to a river, flow in as engines near end of assembly line. Conveyors at left and right are delivering transmission housings and miscellaneous assembled parts. Men in center of picture are attaching water pumps to engine blocks. In foreground is engine transfer point where blocks, which have been moving sideways, are re-positioned for final crankshaft adjustments.

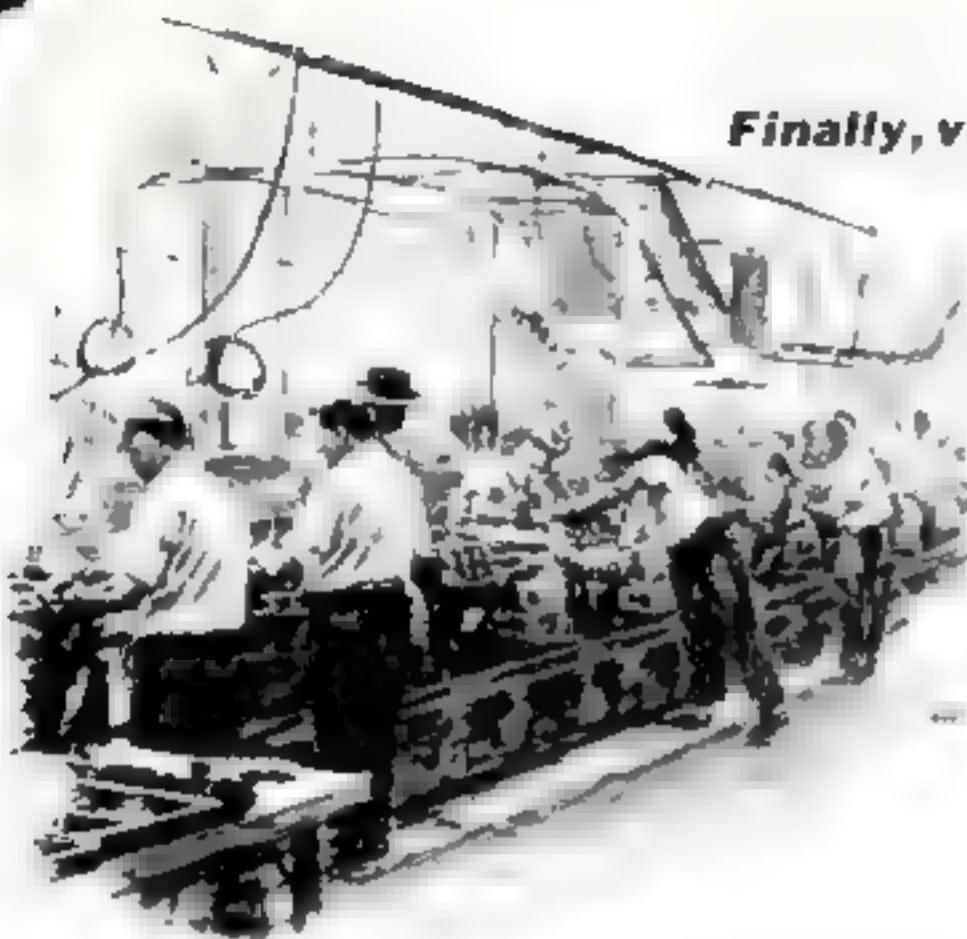
Nut runners outdo the monkey wrench

MULTIPLE TOOL takes guess-work out of tightening nuts on cylinder heads. It imparts exactly right twist to all nuts at the same time.



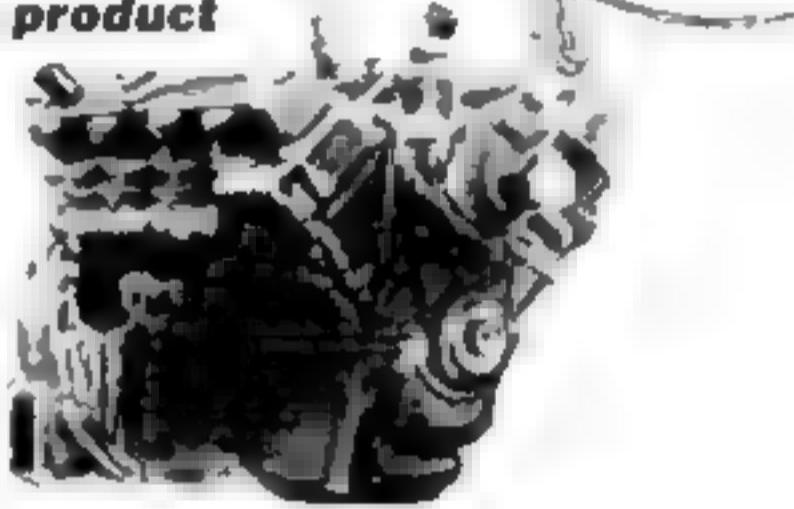
Finally, valves are adjusted

TAPPET SETTING, to prevent that "click" as valves open and close, is done by hand.



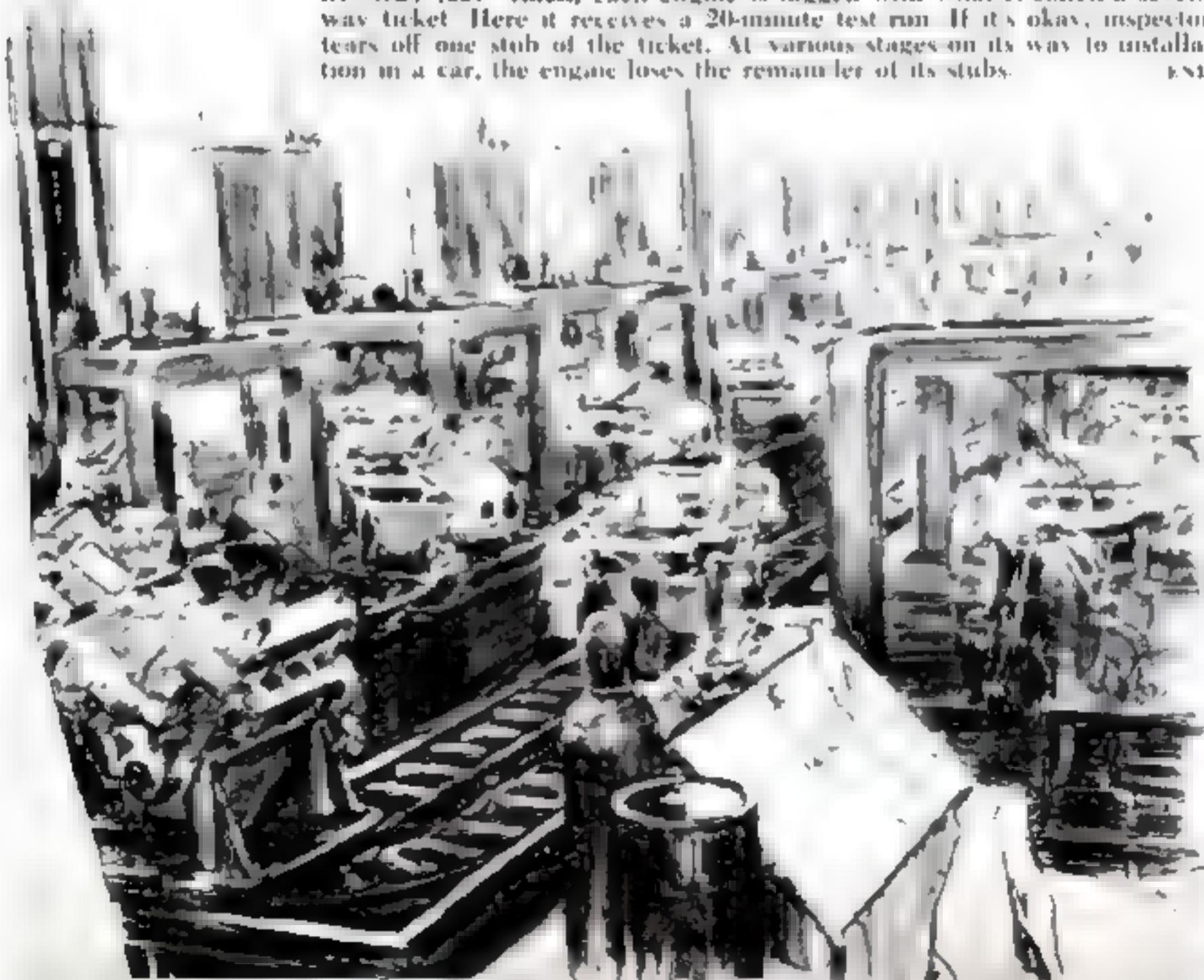
"Bobtailed" engine is the product

HOOKED TO CONVEYOR, engine goes to quality-control station for examination. For convenience in shipping and storage, it is without such accessories as transmission, carburetor, generator, starter and fuel pump. If it passes muster, it will get aluminum spray job in the paint shop.



Engines are ticketed for test

IN "HOT TEST" AREA, each engine is tagged with what is called a seven-way ticket. Here it receives a 20-minute test run. If it's okay, inspector tears off one stub of the ticket. At various stages on its way to installation in a car, the engine loses the remainder of its stubs. EXP



Taking the Pain Out of Paying Parking Fines



DO-IT-YOURSELF SYSTEM now collects fines for overparking. When a cop notices that a motorist has parked too long, he slips an envelope bearing a courteous notice (center) under the

THE police in more than 300 U.S. cities are back on speaking terms with motorists who overpark. Both sides have Harley McMillen to thank.

McMillen is city manager of El Dorado, Kan. One bitter winter night in 1951 he found himself in trouble. A posse of angry citizens had met to demand the removal of parking meters from the streets. They didn't mind the meters. They did mind being haled into court to pay fines for overparking.

McMillen did something about it. He thought of a new way of collecting penalties. Appropriately, it's called the Traf-O-Teria System.

The system consists of a violation notice printed on an envelope, a duplicate, and "courtesy boxes" attached to meter posts—at least one box to a block.

Nº 1

Date _____ Time _____

Licence _____

Meter _____ Officer _____

SORRY, You Have Overparked

The charge for this overtime is 25c if paid within 48 hours. If not paid within 48 hours, the charge is \$1.00.

You may pay this by placing 25c in this envelope and depositing it in any of the yellow Traf-O-Teria Courtesy Boxes located on or near meter posts, or at the Police Station, or mail to Police Department.

NOTE

A charge of 50c is made for each additional hour of overtime parking at same meter.

A failure to remit will result in issuance of summons and added penalty, as provided by ordinance.

JUNCTION CITY POLICE DEPT
JUNCTION CITY, KANSAS

RIGHT: JOHN G. TAKES, JR., AND A. RAYMOND



windshield wiper. The parker, upon returning, puts the money inside and drops the envelope (left) into a box attached to the meter post, from which it is later collected (right).

When a motorist finds one of the little envelopes tucked under his windshield wiper, he slips the amount of his fine (it's small) in the envelope, drops it in the courtesy box and pockets the duplicate, his receipt.

The system takes the sting out of the overparking fine. The message on the violation notice helps, too. The word "fine" appears nowhere.

The success of the Traf-O-Teria in El Dorado deluged McMillen with requests by other cities for blueprints.

City coffers have benefited all over the country. The experience of Tupelo, Miss., is typical. Though the fine for overparking was dropped from \$1 to 25 cents, the city collects more money through the courtesy boxes than it levied in fines for the offense in traffic court.

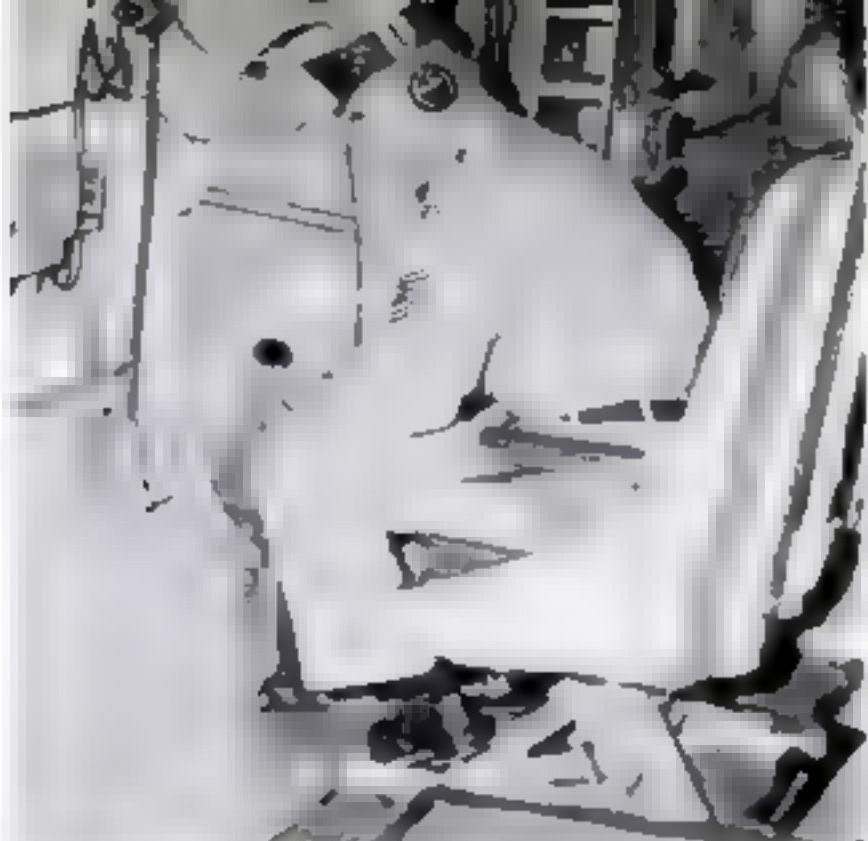
New in Aviation



Flying Crane The copter above is toting a four-ton trailer van between its stiltslike legs. The experimental Hughes YH-17, developed for the Air Force, may lead to huge helicopters

that can haul loads of more than 10 tons or 75 combat-equipped troops. Power is from two turbine engines that supply gas pressure to burners on the rotor tips. The rotor blades span 130 feet.

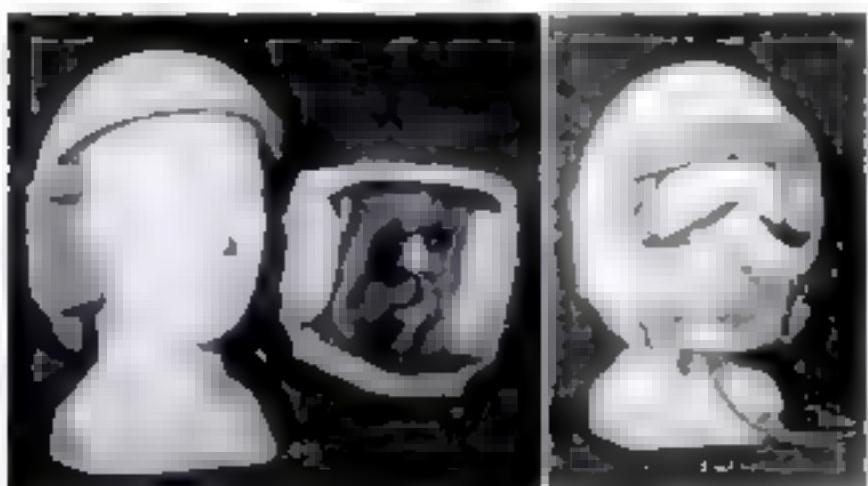
Jet Cabin This model was built by United Air Lines while it was preparing to order 30 Douglas DC-8 airliners (sketch at left). Interior of the full-size 65-foot-long wooden fuselage was fitted with different seating arrangements, buffet and various window sizes. The DC-8 jets are scheduled to go into commercial service on several U.S. airlines during 1959.



Big Bubble Windows amidships enable scanners in the SC-54 new Air Force rescue version of the Skymaster, to look down while searching for survivors. The crew includes paratroopers trained in rescue work.



Target A pulse jet powers Holland's first pilotless airplane, designed as a gunnery target and for radar training. Flight of the AT-21 is electronically controlled. Parachute recovery is provided for the all-plastic craft.



Blastproof This helmet won't blast away in bailouts by supersonic jet pilots. It's a complete head covering, with oxygen mask and communications set. Faceplate, shown removed at left, hinges from either side.



20 Miles Up That's the destination of a man-carrying, pressurized, eight-foot gondola that the Air Force is planning to send aloft soon to study the physical effects of high-altitude on man. Jumping the gun on the Air Force is a simulated-ascension sequence in a new 20th Century-Fox movie, "On the Threshold of Space," from which the above still photograph was taken.



Engine-room bulkhead has inspection windows and access door.

Dual, airplane-like control system is shown in this view.

Looking forward are oxygen tanks, periscope, communications racks.



ENGINE ROOM

DUAL-CONTROL POSITION

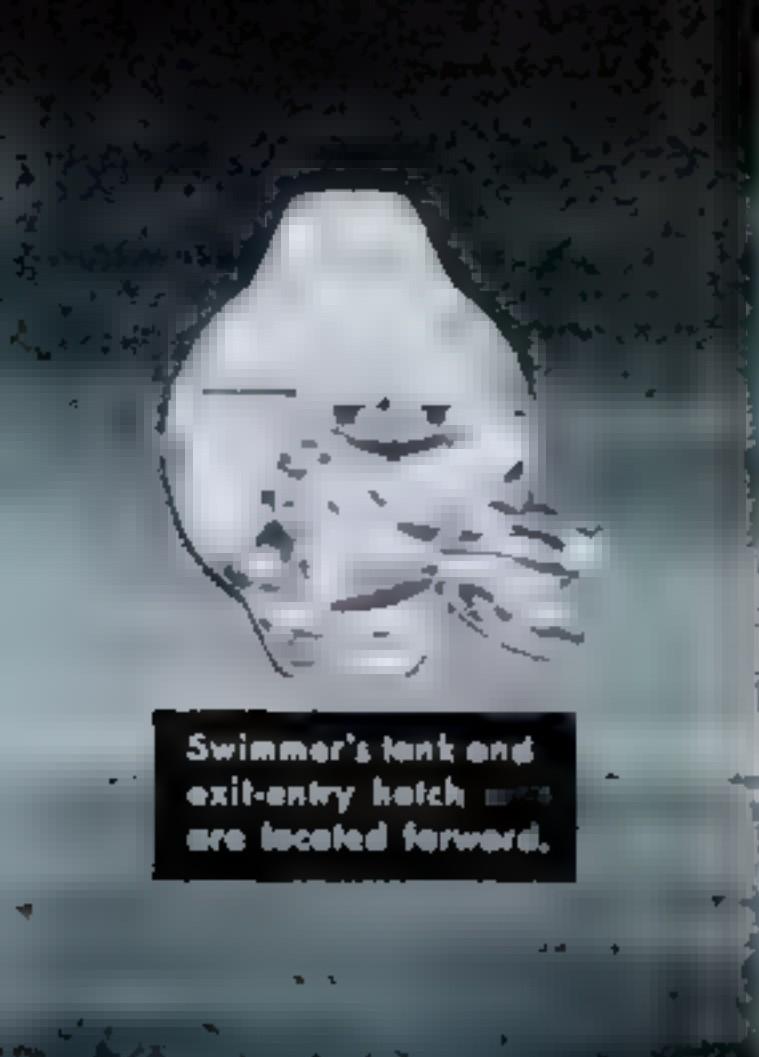
IMMERSIVE SOUNDING EQUIPMENT

QUARTERS ARE CRAMPED for the four-man crew of the X-1, but the designers have squeezed in a maximum of comfort features—bunks, reading table, soft lighting, air conditioning and temperature control, dome-size walkway for exercise, food and water storage, and a hot plate for preparation of warm meals. The separated power plant is insulated to cut down the noise level in the cabin. The dual-control system permits one-man operation of the submarine.

else, food and water storage, and a hot plate for preparation of warm meals. The separated power plant is insulated to cut down the noise level in the cabin. The dual-control system permits one-man operation of the submarine.



Dunking tests in shallow water, which preceded the midget sub's deep-water trials, are clocked



Swimmer's tank and
exit-entry hatch
are located forward.



SWIMMER'S EXIT-ENTRY HATCH



from the dock by engineers.

BABY SUBMARINE—the USS X-1—was born in an aircraft hangar at Farmingdale, N. Y., of the Fairchild Engine Division, whose engineers designed and built it. The Navy's first midget underwater craft, it weighs 25 tons, is 30 feet long and seven feet in diameter.



Four Men Run Half-Pint Sub

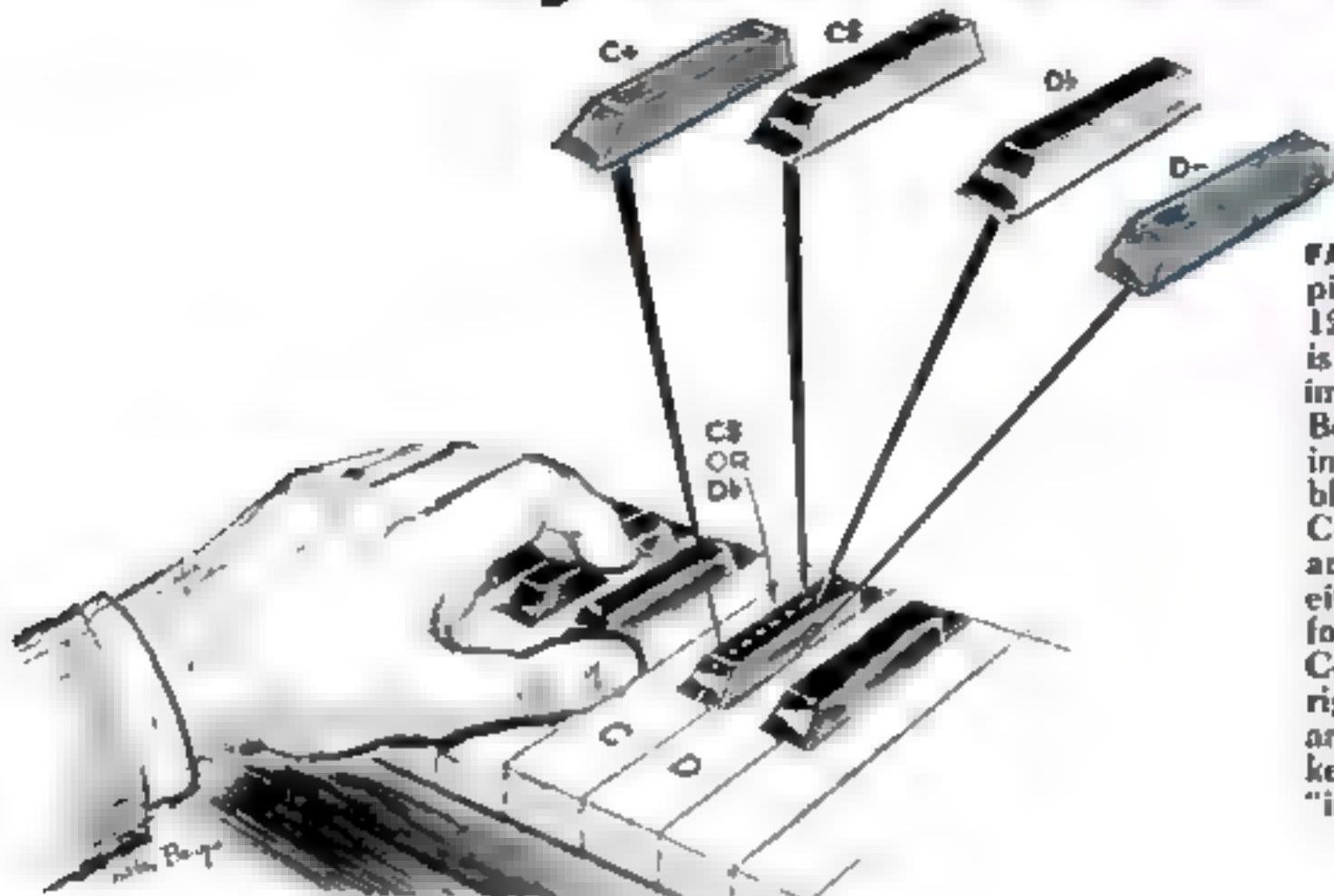
ALTHOUGH one of the first missions of the U.S. Navy's first vest-pocket submarine (X-1) probably will be to test our own harbor defenses, in time of war this role would be reversed.

Silent as underwater shadows, baby submersibles like this could penetrate enemy harbors. Once inside, they could launch missiles with atomic warheads, wreak havoc among shipping, reconnoiter defenses, or send ashore frogmen commandos.

Long range would not be necessary since these tiny pig boats could be launched from aircraft carriers. With the fleet they could serve as a perimeter defense for a surface task force and as enemy-sub killers.



Organ's 31-Note Scale Plays All World's Music



FAMILIAR SCALE of piano or organ, with 12 keys to an octave, is a long-accepted but imperfect compromise. Between C and D, for instance, is a single black key doubling for C-sharp and D-flat and not quite right for either; new scale has four notes as shown. C-sharp and D-flat get rightful pitch as separate black keys. Blue keys play added notes "in the cracks."

Science provides a "perfect" keyboard to impart new beauty to music, classical or modern.

UPON a pipe organ just completed in the Netherlands can be played the music of every civilization of past, present and future.

Its universal scale fulfills musicians' dreams of a playable keyboard with 31 notes to the octave—theoretically the ideal number—instead of the 12 of the familiar chromatic scale. First public recitals, in the Teylers Museum at Haarlem, show what exciting things this makes possible:

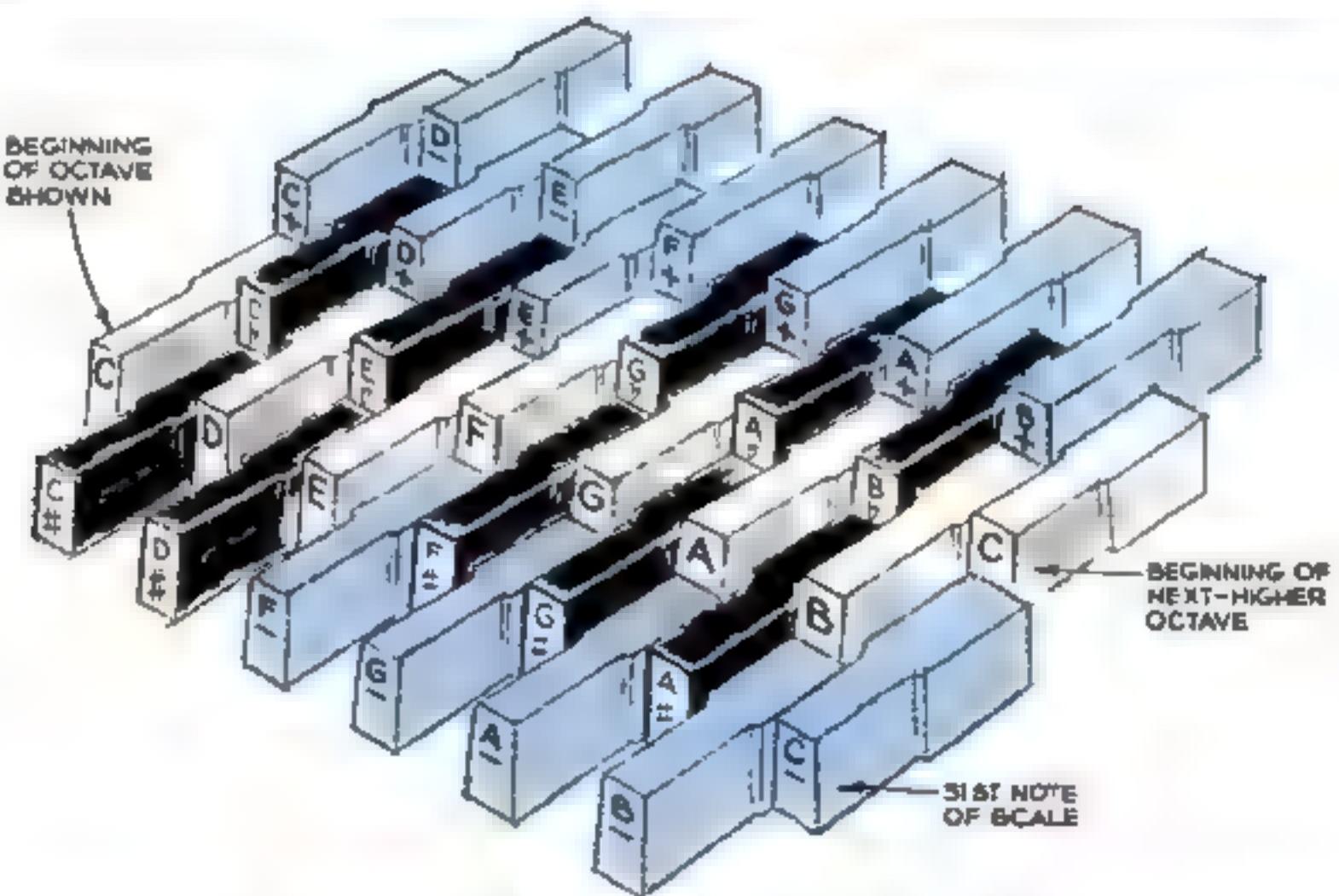
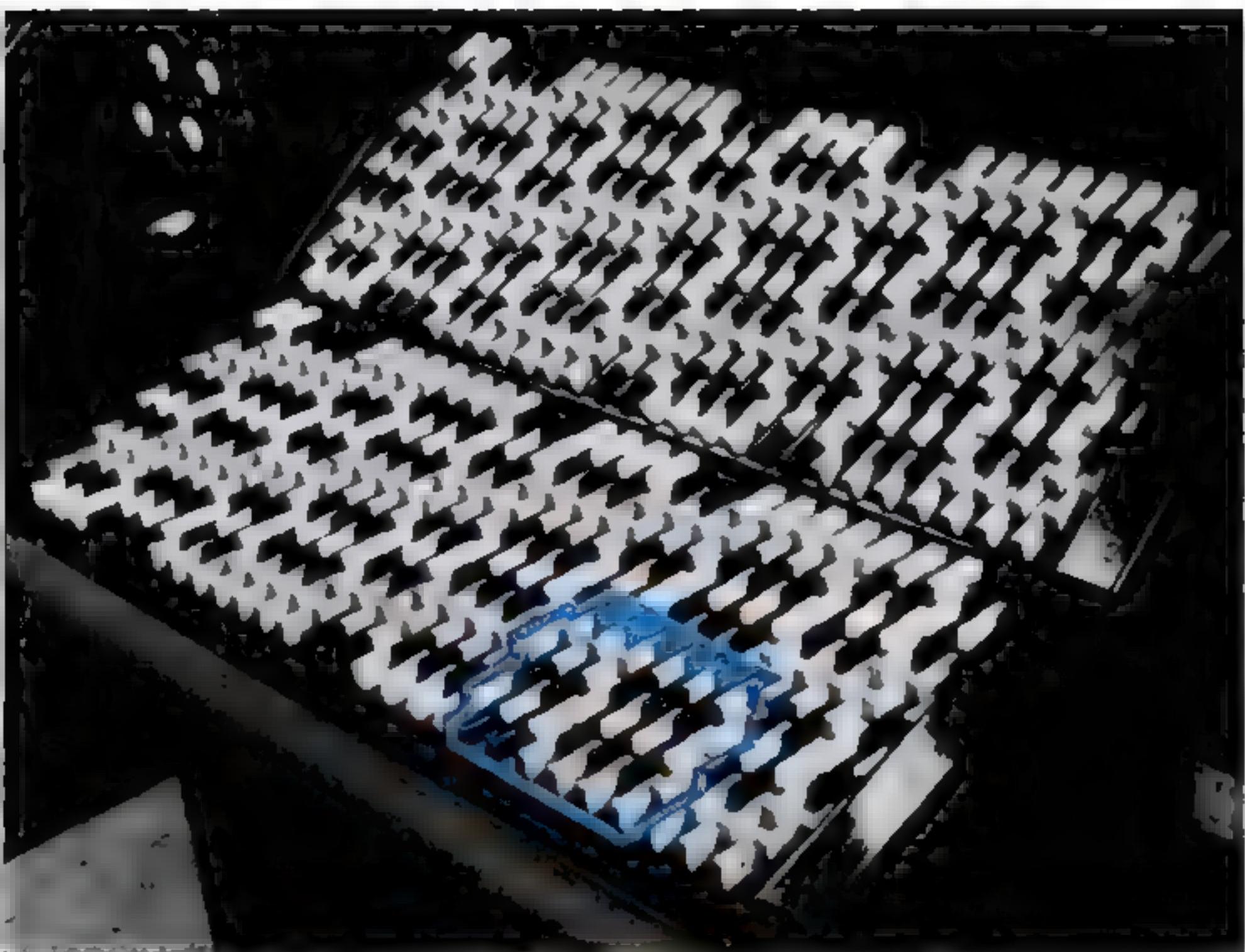
To the classical works of European composers, the organ imparts new beauty, by its supremely "hi-fi" rendition of chords that a conventional keyboard only approximates. With equal facility the organ plays the exotic harmonies of music from such faraway lands as Arabia and Java. It captures the music of songbirds that no other keyboard can imitate. And imaginative composers have begun writing out-of-this-world music with harmonies never heard before, espe-

cially for the keyboard of the new organ.

White, black and blue keys, arranged in tiers on its keyboard, divide an octave scientifically into 31 equal intervals—each representing one-fifth of a tone.

While the new keyboard looks complicated at first glance, many of its hundreds of keys are duplicates for convenient fingering, and their ingenious and logical arrangement simplifies learning to play the organ. Alternatively, a performer of classical music may use an auxiliary console with a conventional keyboard, interconnected by electrical switching with special sections of the complete scale.

The mathematical and musical perfection of the 31-tone scale was discovered as early as the 17th century by the famous Dutch scientist and musician, Christian Huygens, but it has remained until now for scientific advances to create an instrument capable of playing it. The organ's pipes must be tuned so precisely that a pattern on an oscillograph screen, rather than the human ear, tells when the tone adjustment is perfectly accurate.—*Alden P. Armagnac*.



NEW ORGAN arranges keys, top, as in diagram of one-octave portion. White keys play do-re-mi; black keys, true-pitched sharps and flats; blue keys, new "half-sharps" (+) and "half-

flats" (-). On this keyboard can be played any music ever composed—familiar classics, or Oriental music with harmonies novel to Western ears. (Photo from *Scientific Monthly*)



New Wagons Haul More—in Higher

By Devon Francis

STATION wagons this year are looking more like sedans outside and buses inside. They're getting the sweeping, curving lines of conventional passenger cars. And they tote more people. The manufacturers are turning out more of the three-seater jobs that accommodate eight or nine persons.

Rambler wagon has a hardtop look

LOOK, NO TRANSOM: Rambler's rear window can be cranked down into the tailgate, which then works just like any other station-wagon gate. The cargo door on '56 models is a full foot wider than last year's job; cargo space is up 20 cubic feet. Folks must like them: The company says that half its Rambler production last year went into Cross Country wagons.

This reflects, for one thing, the increased use of wagons by suburban housewives in hauling their own and neighborhood kids to school.

One company found that it had pulled a blooper in abandoning its eight-passenger wagon last year. So now it's building a nine-passenger job. Another, for the first time, is offering a three-seat car that will also tote nine.



Chrysler's dream station wagon sets a new peak in plush



WEATHERPROOF FABRIC covers two-thirds of the Plainsman's steel top. Upholstery is calf hide. The rear seat faces backward.



HINGED PANEL on rear fender hides the vertically mounted spare tire. Electric motors operate the tailgate, rear window and third seat.

Style

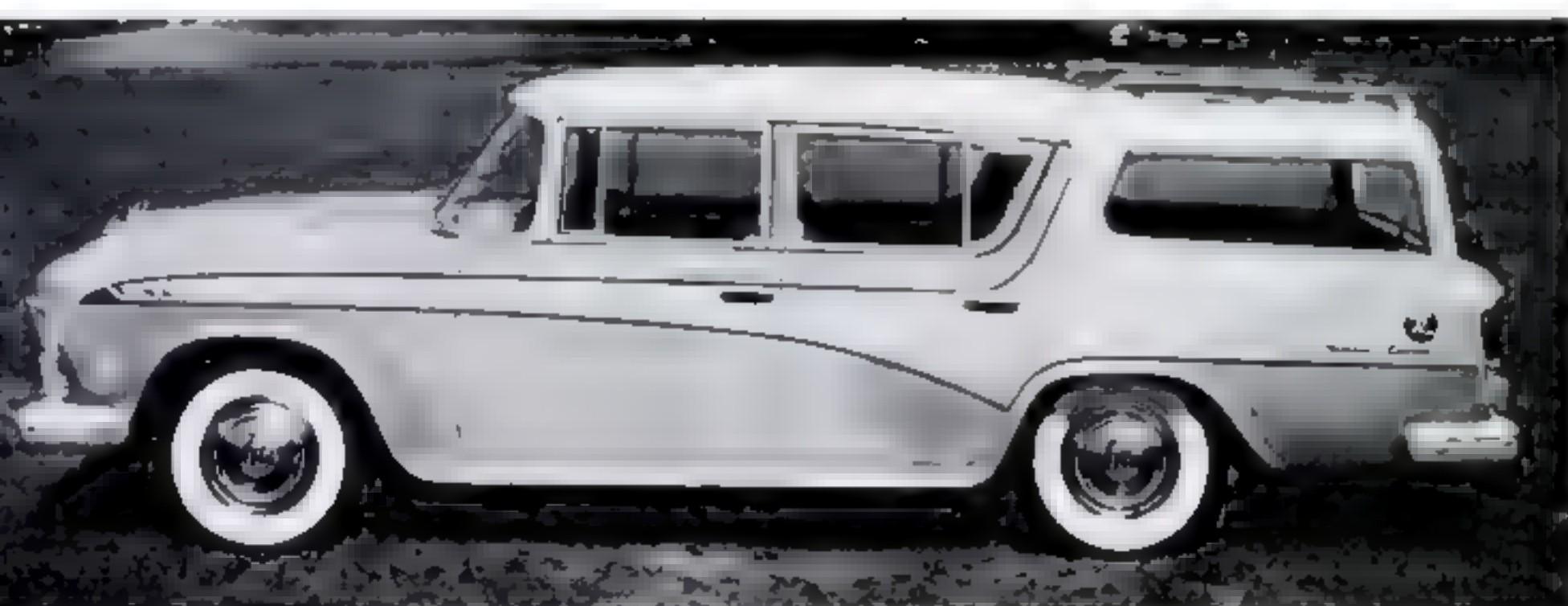


The split seat, expanding the capacity of the second bench from two to three passengers, is becoming more popular.

In all, 42 models of station wagons are in the showrooms. That's how many ver-

ious a dozen manufacturers are turning out—12 more than last year. They're more stylish than ever. They're dreamier.

But the dreamiest of all—the forty-third—is one that's beyond price. It's





CARPETED DODGE can double as an ambulance in an emergency. This wagon is sprung to accommodate a half-ton of cargo. Transoms are counterbalanced. Like Buick (right), Dodge wagon has a split middle seat for easier access.



FOLDED FLUSH, Buick's split seat can be used to support a lengthy piece of cargo and still ride a couple of passengers. Buick is the only manufacturer to cut prices on its wagons—up to \$226. It will triple wagon production.



CHILDREN'S SEAT in rear of DeSoto Firedome is easily removable if space is needed for cargo. The seat is 40.5 inches wide, 12 deep, and 6.7 inches off the floor. It provides 28 inches of headroom. The trim is vinyl plastic.

Chrysler's Plainsman, and there's only one of it—it's strictly a show job.

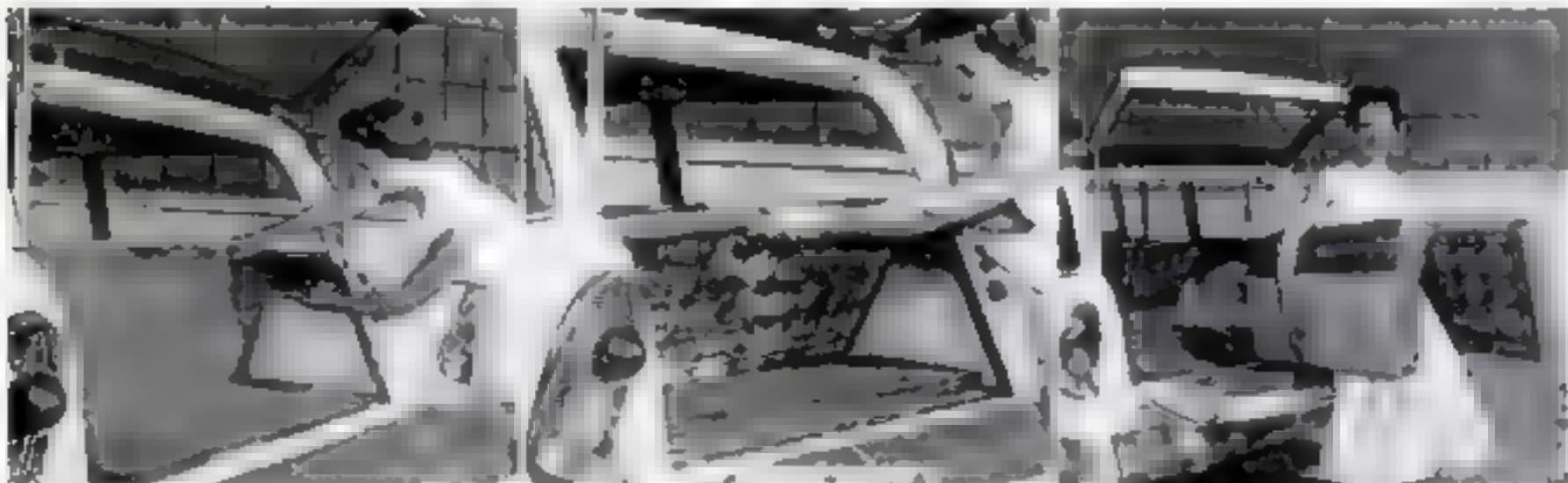
Like the current crop of sedans, hard-tops, coupes and convertibles, the new wagons have more horses up front. Most seats are wider. Upholstery is fancier.

But, compared with last year, scissoring has been done on some of the cargo-loading doors. In other cases, the distance between roof and cargo bed has been chopped.

All this improves the appearance, no doubt, but it won't make a home workshopper—with a four-by-eight plywood sheet to haul—any happier.

Among other changes by individual companies, Studebaker has three complete new lines, and Mercury has added a new six-passenger wagon.

Prices, generally, are up. But price didn't stop the customers in '55. With final returns still to come in, it looks as though 700,000 wagons were sold—some 300,000 beyond predictions a year ago.



TAKING OUT CHEVROLET'S THIRD SEAT is an easy job from inside or out. First, hinged braces that fit into seat backs are released (left). The

seat back is folded flush. The cushion, which is held to the floor by flanges and slots, is then lifted free (center) and removed (right).

Dimensions of '56 Station Wagons

	Length	Width	Height	Front Track	Rear Track	Wheelbase	Front Overhang	Rear Overhang	Front Track	Rear Track	Wheelbase	Front Overhang	Rear Overhang	Length	Width	Height	Front Track	Rear Track	Wheelbase	Front Overhang	Rear Overhang	Length	Width	Height	Front Track	Rear Track	Wheelbase	Front Overhang	Rear Overhang
BUICK SPECIAL ESTATE WAGON	6	2	62 4	-	59 5	35	-	40 8	4	75 3	32 2	56 3	33	104 1	31 4	49 2	30	60 6	76	206 7	4,250	44	6 3	7 60	x 15	\$3,081			
CHEVROLET BEAUVILLE	9	3	62	62 1	46 4	43 5	42	39	4	67	36 9	58 3	84 4	106 1	24	43 6	30	60 8	74 3	200 8	3,682	42	6 5	6 70	x 15	\$2,767*			
CHRYSLER NEW YORKER	6	2	64	-	64	44 6	-	43 5	4	84 8	36 8	64 5	91	122 6	30 5	50	23 8	62 5	31	220 3	4,720	43 7	6 5	6 00	x 15	\$4,011			
DE SOTO FIREDOME	6	2	64	-	64	44 6	-	43 5	4	84 8	36 8	64 5	91	122 3	30 5	46 6	23 8	62 2	29 1	218 8	4,400	43 9	6 2	7 60	x 15	\$3,851*			
DODGE* SIERRA	8	3	63 5	63	63	44 5	43	43	4	83 1	32 3	63 7	81 5	109 3	31 3	46 6	26	60 5	74 1	214 9	3,725*	42 2	5 5	7 10	x 15	\$3,087*			
FORD* COUNTRY SEDAN	8	3	60 5	59 2	43 8	44 3	39 8	37 4	4	90	37	80 5	82 9	105 4	32 1	46	24 2	62 2	75 9	197 6	3,782	41 2	7 2	7 10	x 15	\$2,797			
MERCURY MONTEREY	8	3	55 3	50 2	46	43 8	40 8	37 4	4	90	36 9	80 5	82 4	109	32 1	46	25 8	62 4	76 4	201 9	3,885*	43 6	7	7 60	x 15	\$3,1023*			
PLYMOUTH CUSTOM 4-DOOR	8	3	63 6	63	46 4	44	43	38 5	4	82 1	37 4	64	73	109 4	33	49 6	21 6	60 4	74 6	209	3,755	40 5	5 8	6 70	x 15	\$2,707			
PONTIAC 860 SERIES	9	3	61 0	62 1	46 4	43 4	39 6	43	4	74 8	36 4	56 5	69 2	100 6	28 1	42 6	25 4	61	75 1	206	3,801*	42 5	6 7	7 60	x 15	\$2,956			
RAMBLER CROSS COUNTRY	8	2	59 7	-	60 1	43	-	42	4	80	31 2	55	73 5	95 2	24 5	51	27 5	58 5	71 3	193 6	2,668*	37 5	6 3	6 40	x 15	\$2,833			
STUDEBAKER* PINEHURST	8	2	59 5	-	56 5	42 5	-	41 5	2	65	37 5	42	72	92	30 4	45	27 5	61 0	71 3	200 7	3,560	39	7 1	6 70	x 15	\$2,825			
WILLYS' F4-134	5	2	56 7	-	44	43 6	-	38 6	2	100	44 5	58 2	68 5	95 7	41	44	20	74	71 7	176 2	3,278	43 9	6 1	7 00	x 15	\$2,136			

Prices quoted are suggested factory retail prices and include federal excise tax, automatic transmission where offered, radio and heater; but no other taxes, freight or dealer preparation charges unless specified. Chart lists data (supplied by manufacturer) on only one model of each make. Buick, Chevrolet, Dodge, Ford, Mercury, Plymouth, Pontiac and Studebaker offer more than one model—in some cases, several—in various "lines." Chevrolet, Dodge, Ford, Plymouth and Studebaker offer both 6- and 8-cylinder engines; Rambler only a 6, Willys a 4 and a 6; remaining wagons are V-8s. Ford, Chevrolet, Plymouth, Dodge and Pontiac offer 2-door wagons and 2-door sedans. Mercury, too, has a 2-door. Chrysler and DeSoto have an optional children's seat.

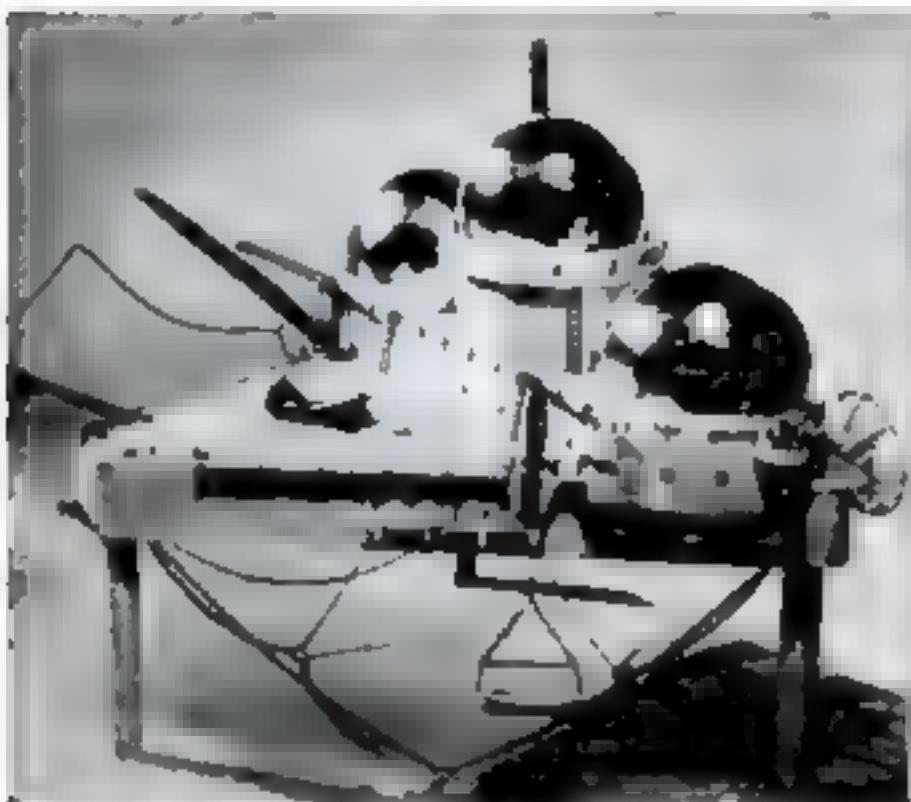
NOTES: *with 8-cyl. engine; *without radio; **includes distribution and handling charges; *shipping weight, does not include gas, oil and water; *excise tax extra; **manual transmission only; 2-wheel drive (three Willys wagons differ only in horsepower and 2- or 4-wheel drive).

Fighting an Air Battle from

AN ELECTRONIC brain is ready to defend the U.S. against air attack. From the ground, its 25,000 tubes, miles of magnetic tape and more than 300,000 memory cores can identify enemy planes and control the weapons that shoot them down.

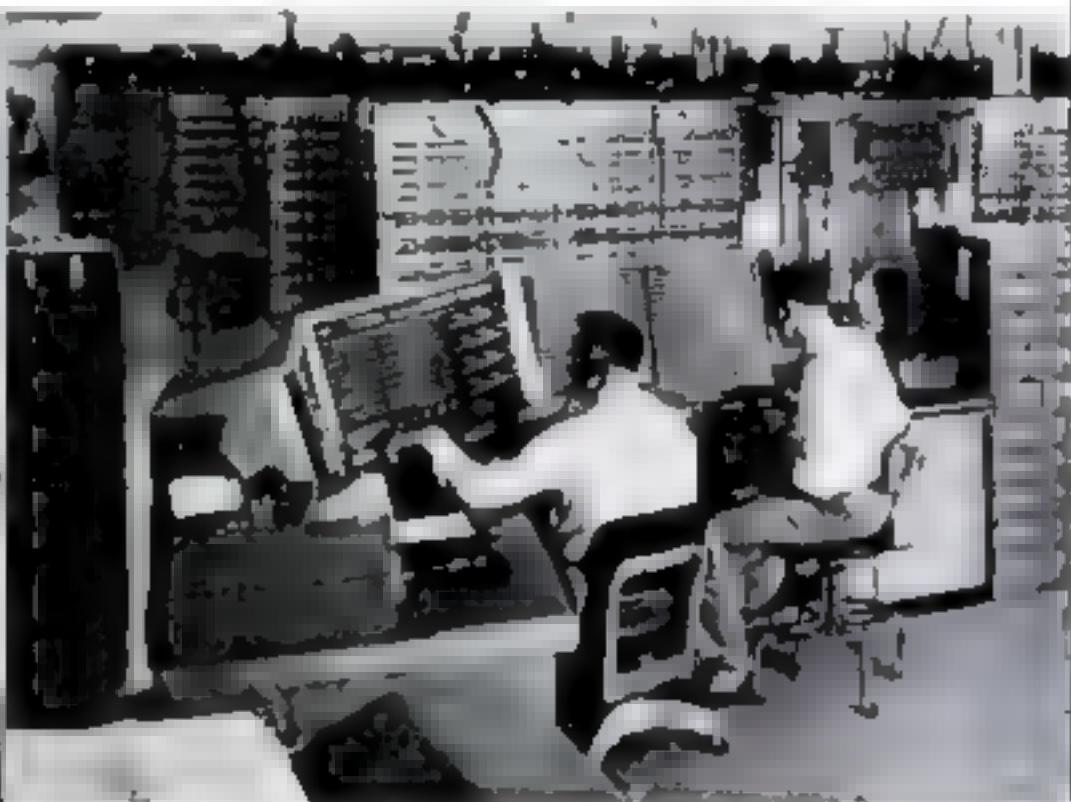
The computer, part of the new Sage

defense system developed at the Lincoln Laboratory of Massachusetts Institute of Technology, shows on TV-like screens the airplanes flying over its area and identifies them. If one turns out to be hostile, it indicates all defense weapons available—even telling where and how soon a fighter can intercept the attacker



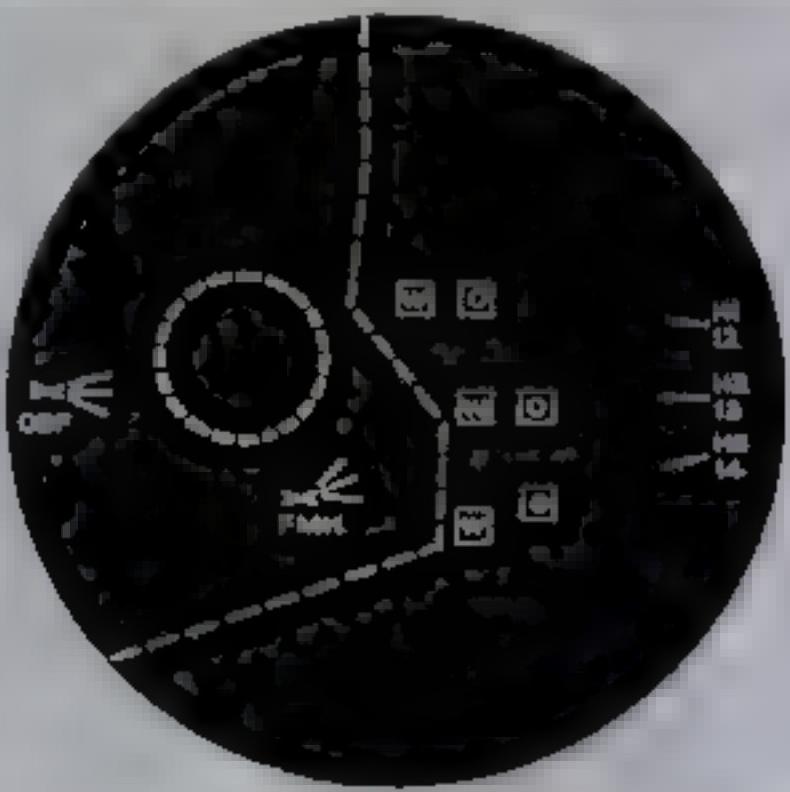
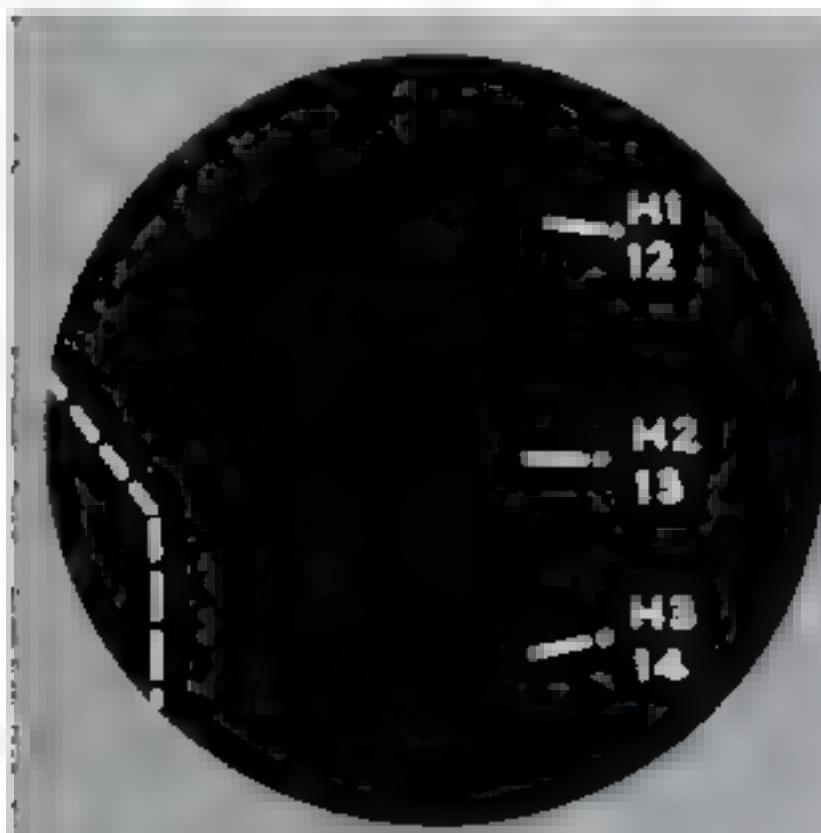
RADARS—on man-made islands, ships, planes and ground—spot aircraft and signal Sage computer. The computer also gets observer reports.

1 BATTLE ON SCOPE begins when three planes are tagged hostile, assigned track numbers 12, 13, 14. Length of dash indicates each plane's speed, direction of dash indicates heading. Here, scope shows enlarged view of hostiles.



COMPUTER checks each plane report against weather data and flight plans it has memorized. When it can't identify one, it rings a bell.

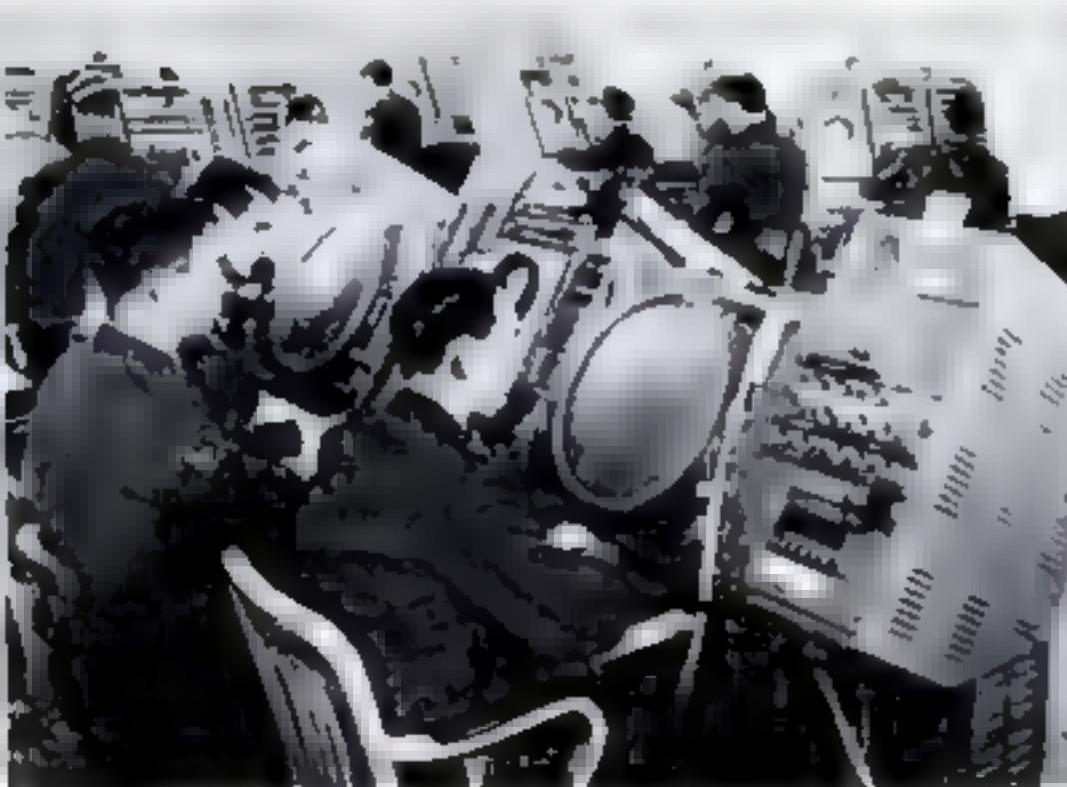
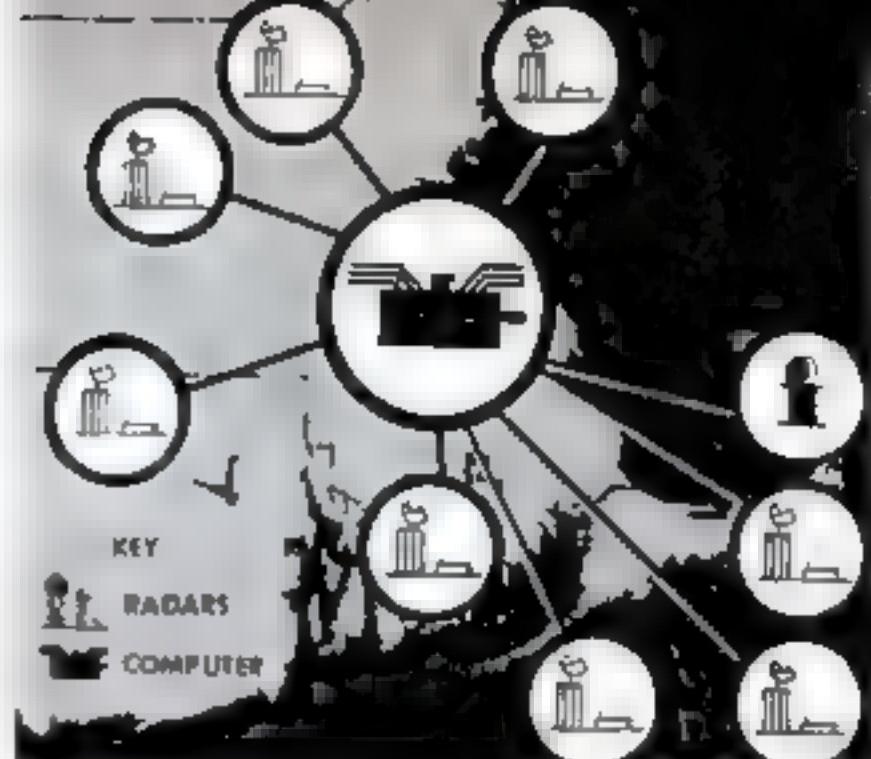
2 BIG PICTURE shows hostiles (right), defense border (dashed line), antiaircraft coverage (circle), Westerly (CEF) and Oberlin (FMH) airfields. Boxes show where Westerly and Oberlin fighters would intercept each hostile.



the Ground

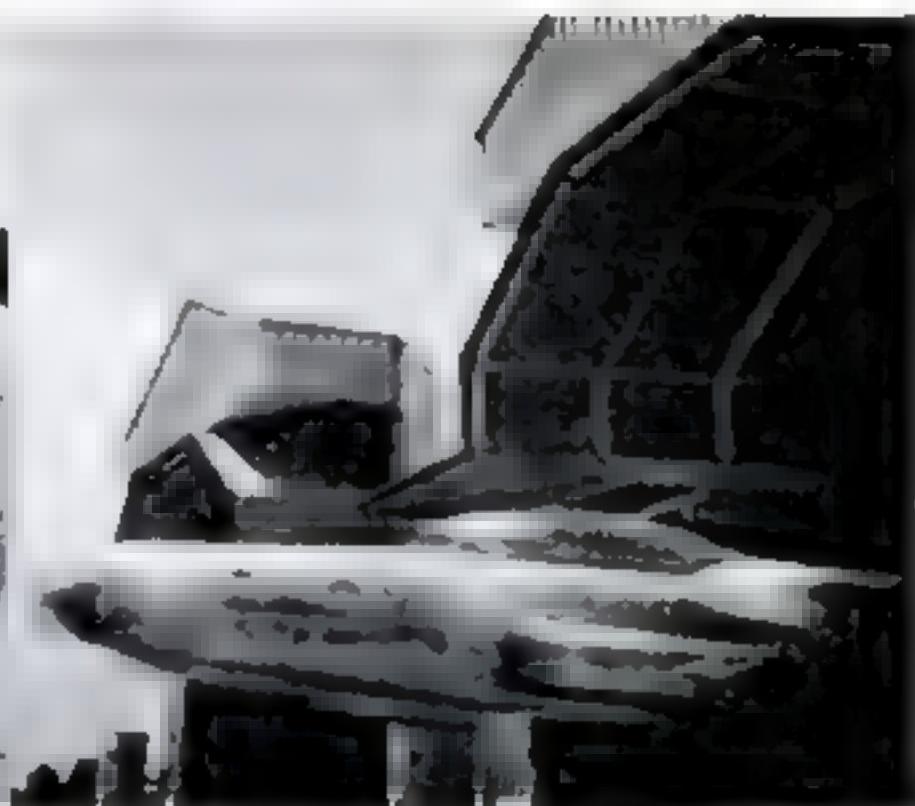
—then actually flies the intercepting planes and missiles to their targets.

To protect the U.S., 32 Direction Centers similar to the test setup in New England (map at right) will be built at a cost of more than a billion dollars. Each center will have two computers—one in use, and one stand-by.—Martin Mann.



SCOPES show electronic sketch of plane tracks, ground, and defense bases. Officer here decides if an unidentified plane track is "hostile."

3 NEW TRACKS are interceptors. From Westerly, tracks 60, 61 head for hostile 1. From Oberlin, track 70 goes after hostile 2, track 71 after hostile 3. Boxes show corrected interception points that computer has calculated.



JET, ordered out by officer at scope, takes off under pilot's control. Computer then flies it to target, radioing signals to automatic pilot.

4 THE END FOR HOSTILE 3 comes as two jets of track 71 separate for the kill, introducing another track (73). Computer now figures interception points (boxes) for each. It looks as if plane of track 71 will get there first.





A Kitchen to Dream About and Maybe Get—Tomorrow

A FULL-VIEW, glass-domed rotating oven and a marble-topped range (foreground) that cooks without getting hot are features of Frigidaire's Kitchen of Tomorrow shown at the GM Motorama. The "dream" kitchen also has a revolving

refrigerator (left rear), in which deliverymen can put milk and frozen foods from outside. Other appliances include a recipe maker that selects and measures ingredients and a phone device to start dinner when you dial from downtown.

They Say Now...

DR. WARREN WEAVER, ROCKEFELLER FOUNDATION: "The most far-reaching discoveries and . . . useful applications regularly flow out of ideas which initially seem abstract . . . Impracticality is more generally important than we are inclined to suppose."

JAY DOBLIN, ILLINOIS INSTITUTE OF TECHNOLOGY: "People spend one-third of their lives in bed. It's time [the bed] was improved."

MORRIS D. HOOVEN, PRESIDENT, AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS: "A queer combination of confidence and un-

eariness confronts the scientist and engineer of today: confidence in his ability to control the physical world; uneasiness concerning the end to which he is leading civilization."

DR. JAMES R. KILLIAN JR., PRESIDENT, MASSACHUSETTS INSTITUTE OF TECHNOLOGY: "At a time when we are forced to match wits on every front with an alert enemy of growing prowess, America's survival requires that the American people attach a higher value to the hard labor of rigorous thought."

DR. WILLARD F. LIBBY, COMMISSIONER, ATOMIC ENERGY COMMISSION: "We could afford to double our present educational expenditure if it would give us one more Fermi per generation."



Conveyor Belt to Speed Army Cargo 10 Miles from Docks

MOVING cargo one to 10 miles inland at the rate of 270 tons an hour, and on grades up to 27 percent, a new U.S. Army Transportation Corps conveyor

system is expected to clear ports faster and with less manpower than trucks. A section of the proposed system is shown being tested above at Fort Eustis, Va.



Rolling Radio Station Guides Tour

BROADCAST over a headset mike and a transmitter on wheels, the voice of a factory guide (pointing) is carried clearly to visitors as far as 40 feet away despite the noise in the plant

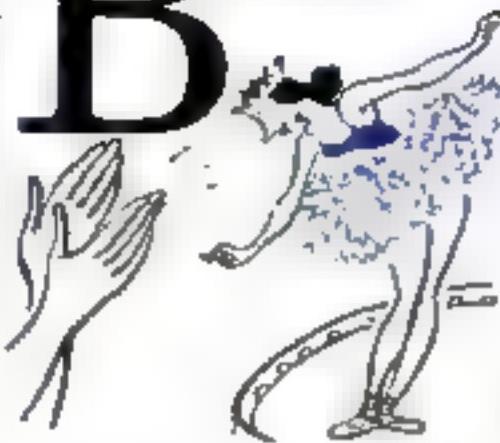
The system was used during a recent press tour of the Hughes Aircraft plant in Culver City, Calif. Each reporter was equipped with a pocket transistor receiver and hearing-aid type earphone. A cart (right) carried the transmitter and extra receivers



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THE 26 words rimming these pages make up the new alphabet adopted this month by the International Civil Aviation Organization (ICAO). They are intended for use by pilots, radiomen and control-tower operators when poor communications or language difficulties make it advisable to spell out words.

To qualify for the ICAO alphabet, every word had to meet rigid requirements: (1) begin with the letter that it represents, (2) be pronounced with understandable similarity by speakers of many nations; (3) cause a minimum of confusion with any other letter word; (4) have some meaning for users of most nationalities.

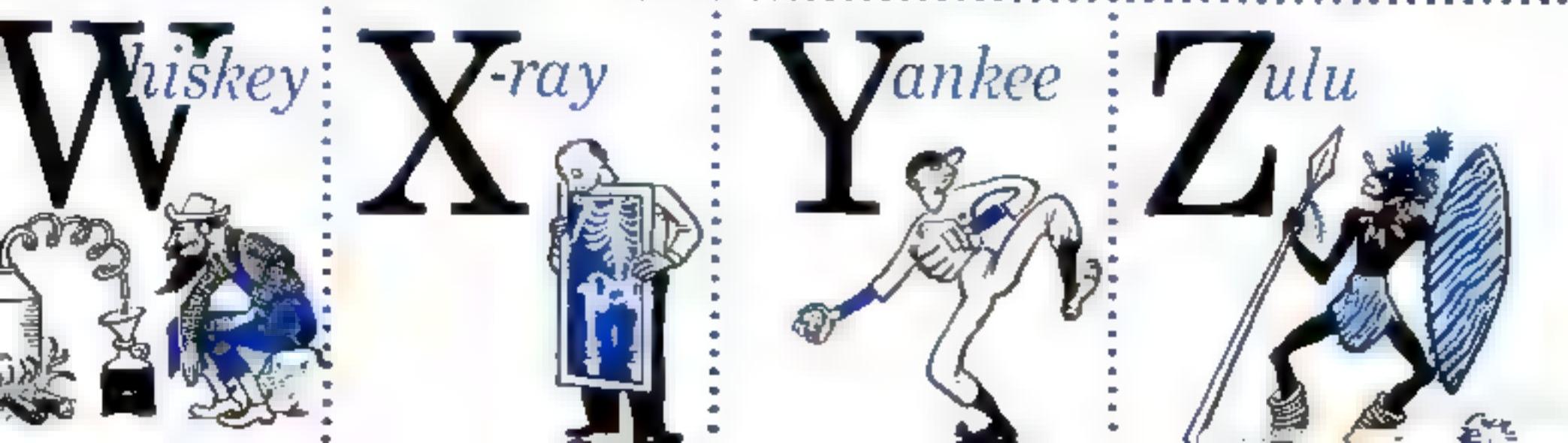


New ABCs

One of the most important uses of the alphabet is with plane-identifying letters and letter codes. A pilot making a landing approach in a plane with the identifying letters RJH, for instance, might say over his radio: "This is RJH. Now I spell. This is ROMEO—JULIETT—HOTEL."

This is the second revision of the ABLE, BAKER, CHARLIE alphabet that millions of GIs learned during World War II. ICAO hopes that the new alphabet, arrived at after thousands of tests here and abroad, will eventually become the standard, replacing some 75 word alphabets now in use throughout the world.—Herbert O. Johansen.

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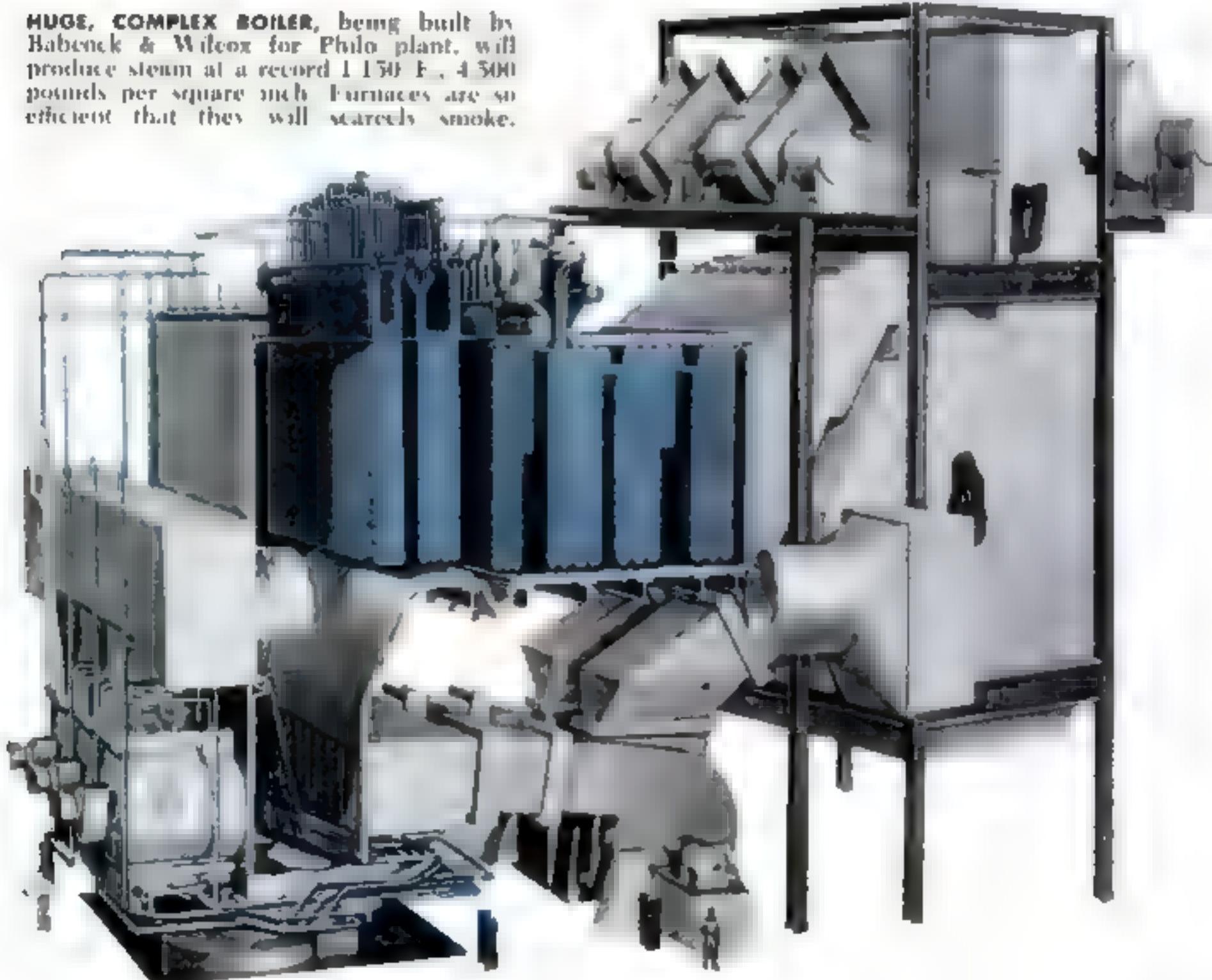


WORLD'S MOST EFFICIENT steam boiler will be fired up this spring as a new unit in the Philo generating plant of the Ohio Power Co. on the Muskingum River near Zanesville. Conveyor at right in photo brings in coal, which is ground to powder and blown into furnaces.

Squeezing More Power from Coal

A new Ohio generating plant will set a record by burning less than 11 ounces of coal to make a kilowatt-hour of electricity.

HUGE, COMPLEX BOILER, being built by Babcock & Wilcox for Philo plant, will produce steam at a record 1,150 F., 4,500 pounds per square inch. Furnaces are so efficient that they will scarcely smoke.



By Harland Manchester

WHILE dramatic prospects of power from the atom and from the sun have stirred the public imagination, a revolution has been quietly taking place in today's electric power plants. The major source of electric power now is coal, which is burned to make steam to turn the turbines which run the electric generators. Dams account for about 21 percent of our electricity, and gas and oil play a part, but coal is still the solid base of our power, and will be for many years to come.

Year by year the industry has been squeezing more power out of a pound of coal—and the cost of electricity has been going steadily down for three decades, even though the general cost of living has been zooming upward.

In 1920 it took three pounds of coal to produce a kilowatt-hour of electricity—enough to run a 100-watt bulb 10 hours. Since then, that heap of coal has been steadily reduced, ounce by ounce, with annual savings running into many millions of tons and dollars. Today it has been reduced to less than a pound, and we are now on the threshold of brilliant new triumphs in power-plant design which will cut it still lower.

Breakthrough on the cost front. This May, leading engineers will gather at Zanesville, Ohio, to witness a major breakthrough in cheap power production. When the switch is turned on in a new unit of the Philo plant of the Ohio Power Company, a new world economy record will be set—for this plant, of a size to supply 250,000 homes, is designed to burn only two-thirds of a pound of coal per kilowatt-hour.

Plans to build a larger plant of the same radical new design have been announced by the Cleveland Electric Illuminating Company, and next year the Philadelphia Electric Company will open a still larger plant, which, its engineers figure, will cut that heap of coal to about three-fifths of a pound.

These three plants will turn out power enough to supply nearly a million and a



NINE AND A HALF MILES OF TUBING line a boiler that rises 10 stories above the floor in the Philo plant. As flames lick the tubes, water inside flashes into steam without boiling.

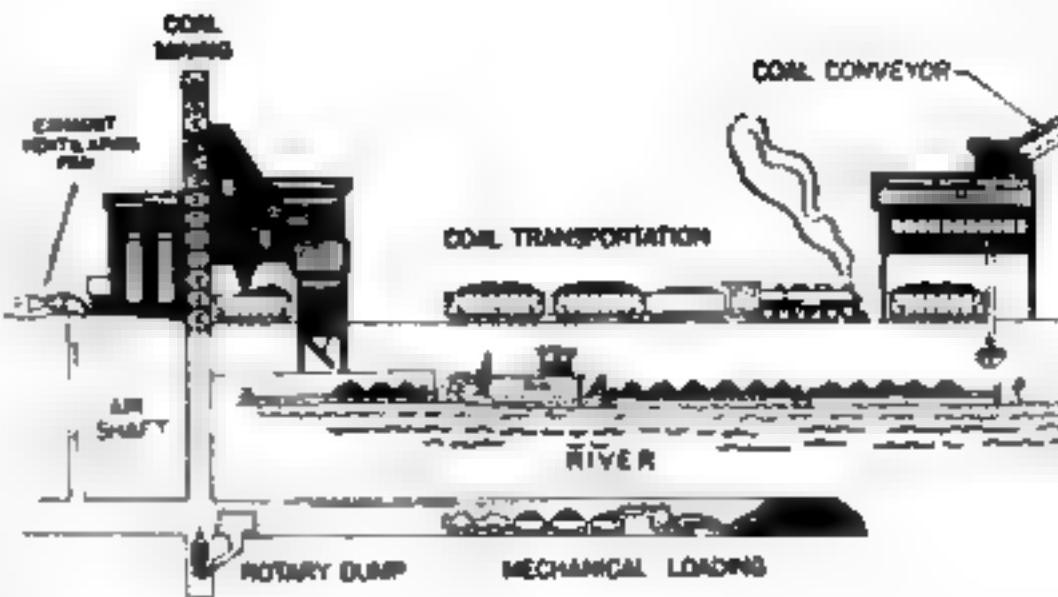
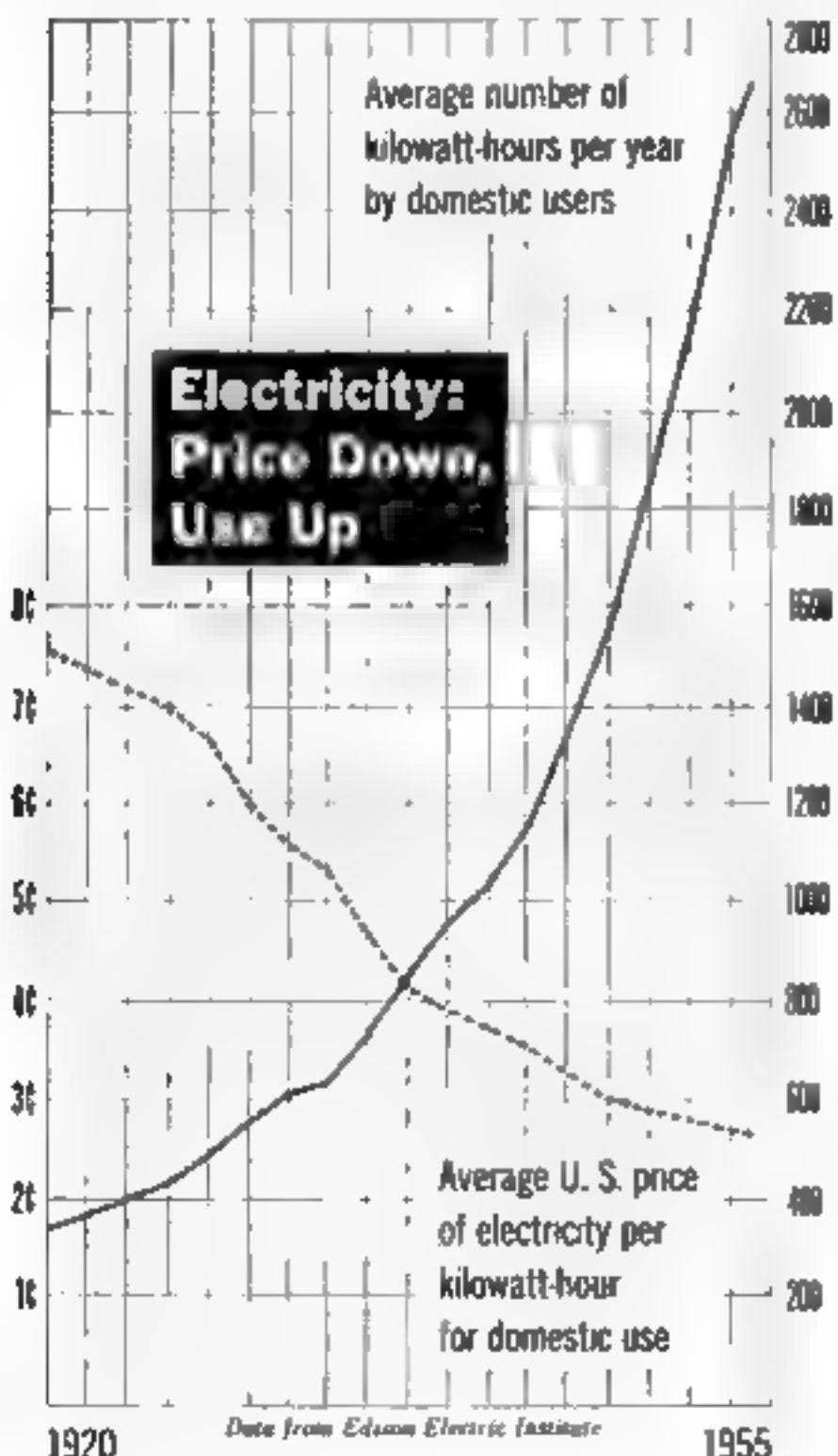
half homes, at an estimated saving of almost half a million tons of coal a year compared with today's average plants. Although these highly efficient plants will turn out only about one-half of one percent of the country's electric power, they will set a standard for future construction, with profound effects upon the national economy as well as the customer's light bill.

Pouring on the steam. Many improvements in furnaces, boilers and turbines have played their part, but the nub

of the great efficiency drive has been a constant increase in the pressure and temperature of the steam. In any engine, the hotter the steam or gas it produces, and the more heat converted into energy on the way through, the greater is the power obtained from the fuel.

One of the first steps in making hotter steam came with the discovery that if you ground up the coal as fine as face powder and blew it into the firebox, you could get far more heat out of the coal than by burning it in lumps. Today all big plants burn pulverized coal, but when it was first tried at the Oneida Street plant in Milwaukee in 1918, there were many scoffers.

Early pioneering was done by two young marine engineers, Fred Dornbrook and John Anderson, who worked on hand-stoked steamboats. Dornbrook, now 80 and retired, got his first hunch when he was an oiler, in 1900, on the



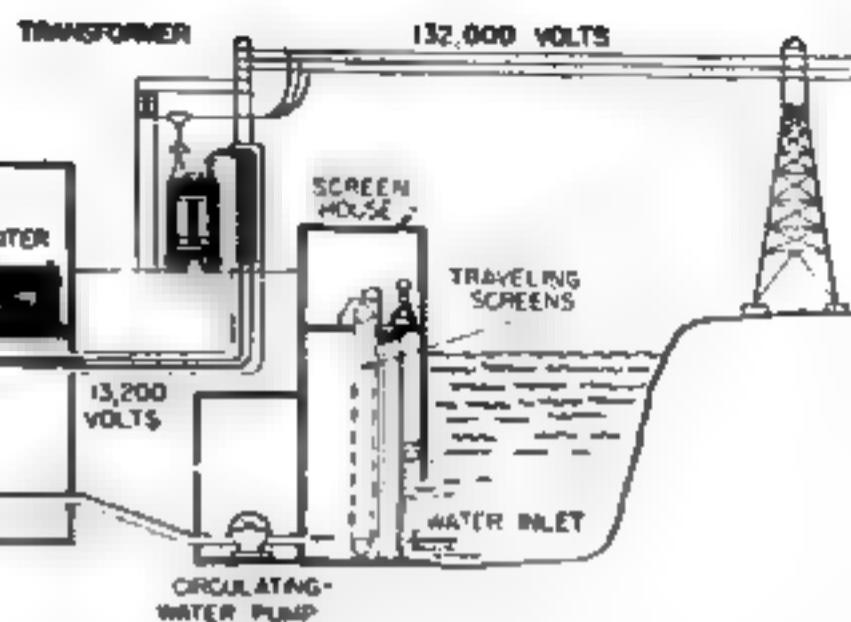
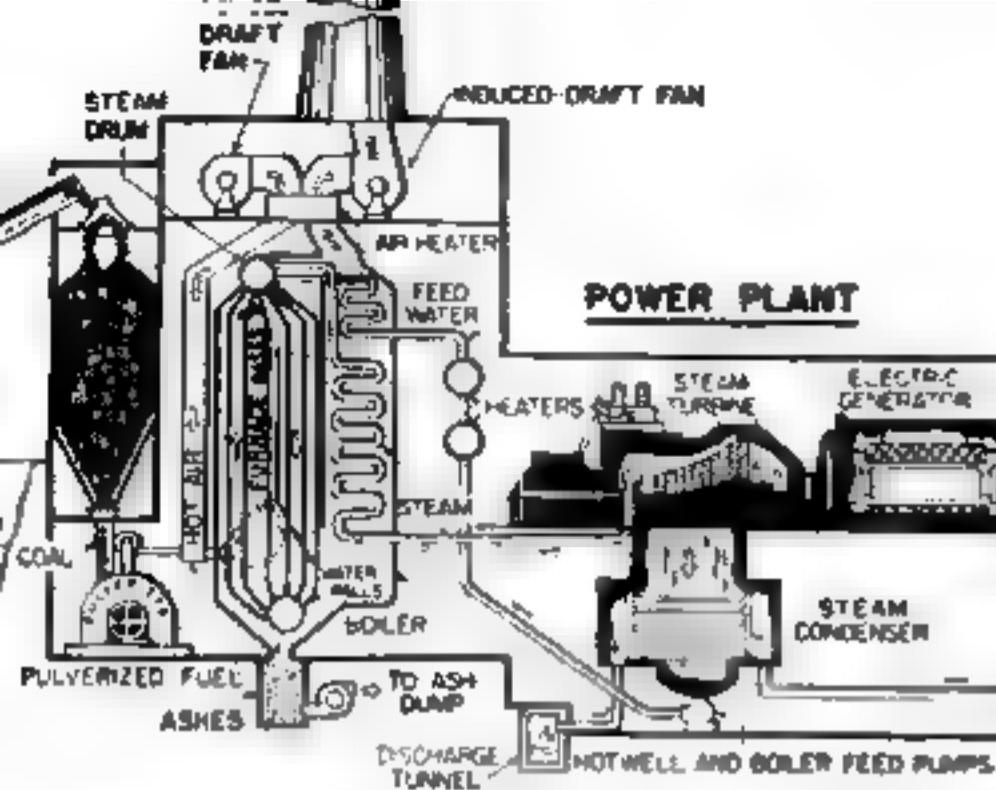
How a steam plant turns coal into electricity.

cranky coal-and-ore freighter *Angeline*, which plied Lake Michigan out of Milwaukee. The fleet owners paid an annual bonus to the boat with the best fuel-economy record, and the *Angeline* was at the bottom of the list. The boiler room was so hot that there was a fast turnover in stokers. Dornbrook, a mechanically ingenious farm boy, refitted a boiler and tried new ways of feeding the fire.

Dusting the fire. At that time the fine coal that broke off the lumps was considered a nuisance and was often thrown overboard. Dornbrook flirted with death by tossing this dust on the fire, and found that the steam gauge responded. He got a sieve and saved fine coal for his experiments, and soon the *Angeline* rose to second place in the fleet. But one day Dornbrook made the fire so hot that it burned out the furnace wall.

Undismayed, the chief engineer told him that he had a good idea, and Dornbrook drew sketches of a machine like a farm feed grinder that would powder the coal and carry it into the firebox. But his machine was just too big for the available space; the *Angeline* chugged along without it.

Dornbrook took to the shore and began working in power stations, telling anyone who would listen that you could burn coal more efficiently if you ground it up, so that more of the coal's surface would be exposed to oxygen and fire. Pulverized fuel was already being used in cement plants, metallurgical furnaces, locomotives, and in a few boiler furnaces,



The secret of its efficiency is pulverizing the fuel for hotter, more complete burning.

but few people thought it practical for boilers.

In John Anderson, Dornbrook found a fellow believer in pulverized coal. The two engineers ground up, sifted and burned many tons of coal, and, with the aid of the then Locomotive Pulverized Fuel Company, finally worked out a plan for a pulverized coal burner that interested executives of the Milwaukee Electric Railway and Light Company (now Wisconsin Electric Power Company).

New problems, new solutions. The new fuel caused a number of explosions and created new problems that took years to solve. First they ran the coal through a crusher, then through a ball mill and a fine screen. Bits of "tramp" iron in the fuel punched holes in the screen, so they worked out a magnetic device to remove these bits. The moisture in the fine fuel turned it into mud, and a hot-air drying device had to be installed. The high pressures and temperatures made possible by the powdered coal ruined various furnace parts, so the whole unit had to be redesigned.

Finally the new system was tried out on one boiler of the old Oneida Street plant—a cheap guinea pig because it was soon to be retired. The idea looked promising. More boilers were fitted, and tests showed that substantially more heat was obtained from the coal than in the average plant.

As a result, the company built the Lakeside plant near Milwaukee—the first full-scale utility plant fired exclusively

with pulverized coal. This plant, opened in 1920, soon broke all records in fuel economy and became a Mecca for power engineers from all over the world. When it was built, even the most advanced plants used about two pounds of coal to produce a kilowatt-hour. Constantly improved and enlarged, the Lakeside plant cut this figure in half in one decade.

Following the leader. Lakeside gave the whole industry a mark to shoot at. A few years after it opened, similar plants were built in St. Louis, Denver, and Detroit. Since most utility plants are operated at least 25 years before being replaced, the whole industry cannot be revolutionized overnight, but practically every big coal-burning plant built since 1935 has been designed to burn the pulverized fuel. As this took place, pressures and temperatures of steam throughout the country went steadily up, while the coal needed to make a unit of power went steadily down.

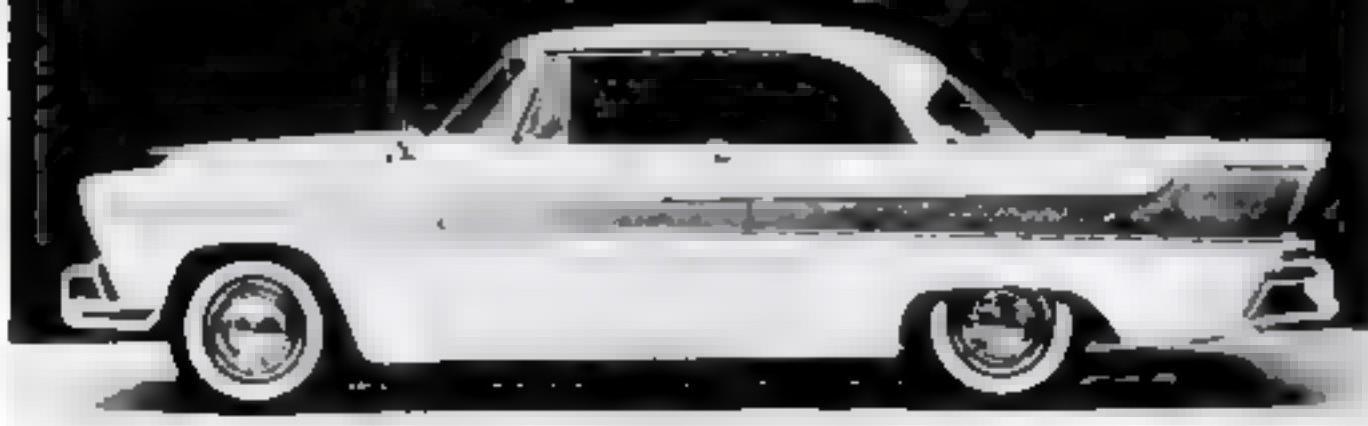
At every advance, engineers have run into the same problem that Fred Dornbrook met when his hotter fire burned out the furnace of the old *Angeline*. With each increase in pressure and temperature of steam, metals once suitable for boilers and pipes would quickly disintegrate, and rugged new alloys had to be found that could take it.

Once it was thought that there was a final barrier to making hotter steam, comparable to the sound barrier in aviation. If you heat locked-in water to a high

[Continued on page 267]

Plymouth

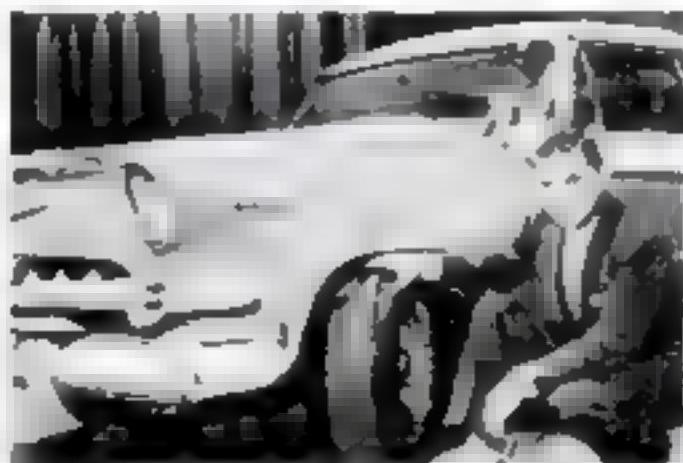
A golden and white hardtop, the Fury has a 240-horsepower engine. It has a displacement of 303 cubic inches and a compression ratio of 9.25:1. A four-barrel carburetor and high-output valve train are standard, help-



ing the Fury to set a 124-m.p.h. record recently. Shift-loving drivers can get this car with a manual transmission if they want one.

Dodge

The "300" chassis, which involves a lowered suspension and a high-output engine, can now be had with several Dodge bodies, including convertibles and hardtops. Its 315-cubic-inch engine, with 9.25:1 compression,



is rated at 260 horsepower with one carburetor. A special intake manifold (above) to carry two four-barrel carburetors is optional.

Chrysler Builds New Family of Stock Hot Rods

FOR buyers with an uncontrollable urge to have the mostest the Chrysler Corporation offers an array of high-performance vehicles. They get their zip, to a considerable extent, from the use of speed-shop equipment—though now it's factory-installed.

DeSoto

The Adventurer, an extra-lush hardtop with a gold-painted engine and flecks of gold in its black carpeting, tucks 315 horsepower under its hood. Increasing the bore raises the displacement to 341 cubic inches and there is



a high-lift camshaft. Power brakes, an automatic transmission, and a brace of four-barrel carburetors are standard equipment.

Chrysler

The 300B, called by its maker the highest-powered car in America, is now rated at 340 horsepower at 5,200 r.p.m. Torque is 385 pound-feet. Buyers who want to sling it around can get special wide-rim wheels for



better cornering. New this year: an optional manual gearbox and a choice of 14 different axle ratios ranging from 3.08 to 6.17.

Comic Strip Reports the News in Aviation

At times "Buz Sawyer" and his creator even beat Page 1 with stories of our new jet planes.

By David R. Lindsay

WHEN the Martin Sea Master, a multijet experimental Navy seaplane, crashed recently, real life was unfortunately following fiction. The Sea Master had been in the cast of "Buz Sawyer," a syndicated comic strip about the adventures of a Navy pilot. In the strip, the plane had cracked up only a short while before.

A few months earlier, the comic strip had carried the story of another crash—the explosion of the Sea Dart, an experimental Navy jet seaplane with retractable skids instead of floats. The comic-strip version of the accident was published about three weeks after the plane actually exploded on a test flight, and accurately depicted the tragedy.

Navy thank-you note. After the Sea Dart tragedy, Admiral Apollo Soucek, then Chief of the Navy Bureau of Aeronautics, wrote an unusual fan letter to Roy Crane, the artist who originated and still turns out "Buz Sawyer," and who had witnessed the explosion of the Sea Dart. The admiral said:

"I know of no medium whereby the Navy's activities are so accurately and dramatically painted as in your pictures. Specifically, I believe your portrayal of

LIKE A REPORTER, cartoonist Roy Crane covers demonstrations of new aircraft. Here he is taking down some notes at the first public showing of the Navy's vertical-rising Pogo plane.





Sea Dart exploded (news pictures above) while Crane was watching with a party of newsmen



Amazing Pogo plane (above) was flown by Buz Sawyer soon after its first public appearance.

the loss of the Sea Dart is one of the best things that has been done. We all recognize the hazards that our pilots take, but it seems to me that you paid a fine tribute there to Richbourg [the pilot of the real Sea Dart]. I would like to compliment and congratulate you on this fine service."

Earlier in the cartoon strip, the Sea Dart and another plane had been shown being used to try out a new "cushion-landing" device—a flexible rubber aircraft-carrier deck intended to cut down on the space needed to land high-speed planes. When the sequence involving the rubber deck hit the newspapers, some official eyebrows were raised. The Navy,

it turned out, had actually been testing such a device but keeping it under wraps. Crane had not been guilty of any security leaks, however; he hadn't even known of the Navy's work. He had simply spotted an obscure story about French and British cushion-landing tests in a trade magazine, and let his imagination do the rest.

A head start on Edna. Another time, Crane wanted to have his hero, Buz Sawyer, do some hurricane chasing. For this he dreamed up a ripsnorter of a storm which he named Edna. Of course, just after that was printed, the real Edna blew roofs off all along the east coast. A lot of readers immediately wrote in want-

NOV. 4, 1954. THE WORLD'S
SEAPLANE, THE SEADART,
PLUMMETS INTO THE BAY.



WHEN A HUSH AS A HELICOPTER CIRCLES
OVER A SWIRL OF WATER, AND BOATS
WITH FROGMEN HURRY TO THE RESCUE.

BUT TO NO AVAIL.
B ANOTHER TEST
PILOT, CHARLES E.
RICHBOURG, HAS LOST
HIS LIFE... FOR YOU
AND FOR ME... IN
FURTHERING THE
PROGRESS OF
NATIONAL DEFENSE.

Roy Crane

11-24

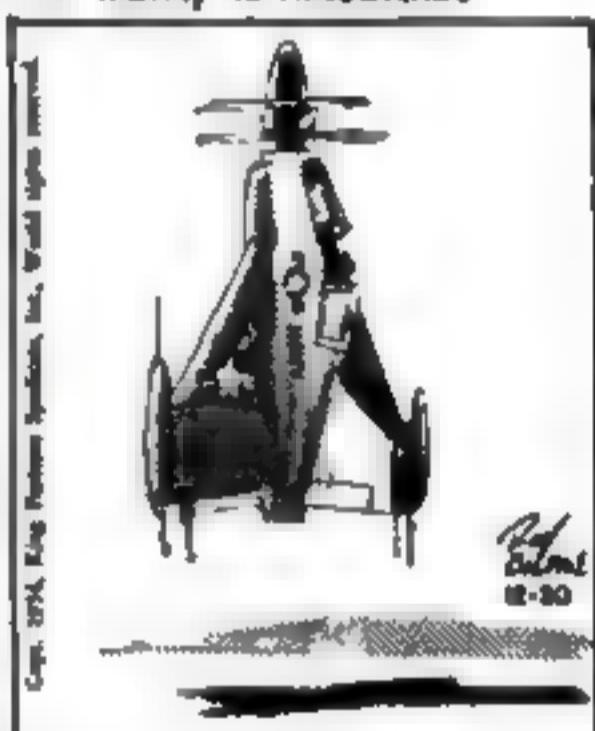
Three weeks later his comic strip, "Buz Sawyer," retold story, paid tribute to the pilot.

WHERE'S A BUZZ OF EXCITEMENT.
ON HAND ARE FIRE TRUCKS,
TECHNICIANS AND GUARDS
BY THE DOZENS.



ENGINES ROAR, PROPS BEGIN TO TURN
SLOWLY, THEN FASTER. BUZ ADDS
A TRIFLE MORE POWER...

BUZ, EVEN TO HIS OWN AMAZE-
MENT, IS AIRBORNE.



Crane, present at that demonstration, accurately pictured it in this strip six weeks later.

ing to know how Crane had had advance word, Roy insisted that he had no crystal ball but just knew how the Weather Bureau names hurricanes.

The man who keeps Buz Sawyer so up-to-the-minute, and often ahead of the news, has never piloted a plane, never studied aeronautics, never been in the Navy or any other armed service. Roy Crane is a short, slight, thoughtful man of 54 with rimless glasses and a little mustache, who says he decided to be a cartoonist because he thought it would be an easy life. As it turned out, he has had to work like a dog.

Getting the facts. A perfectionist, both as a cartoonist and as a reporter, Crane

is never satisfied with his work. He has frequently scrapped finished strips, which his syndicate considered fine, because he felt that he could improve them a little. He follows aviation trade journals carefully, goes on press junkets to see new planes (he flew to California to look at the Navy's vertical take-off Pogo plane, then used it in his strip), maintains a clipping and picture morgue that fills several large filing cabinets, and spends \$150 to \$200 a month on long-distance phone calls from his Orlando, Fla., home to aviation-company engineers, test pilots, and Navy experts all over to get his facts and drawings straight.

His newsiness and meticulousness have

helped to make his strip one of the most successful of the adventure cartoons. His syndicated feature appears in 450 domestic papers and around 100 others, with a combined readership of several million people.

Atomic beat. Roy Crane's list of "beats" rivals that of many top newsmen. As he says, sometimes they get "too hot for comfort." The reason the new Sea Master got into his strip was that he wanted a plane that could be powered by atomic engines. Without any official information at all, he tried to figure out what the Navy might do. He reasoned that the plane should be large, have several engines, and be a bomber so that the first atomic engine could be lowered from the bomb bay for the initial tests. For unlimited landing and take-off space he picked a seaplane.

After his episode about the atom-powered version of the Sea Master appeared in "Buz Sawyer," the Secretary of the Navy confirmed Crane's reasoning by announcing that the Navy was considering the Sea Master as a prototype for a possible atomic-powered seaplane.

As in the case of the Sea Master, Roy's biggest news beats have come when the Navy has given him no help at all and he's had to depend on his own imagination and horse sense.

Buz gets there first. During World War II that happened when he wanted to have Buz Sawyer fly an intelligence officer to a Jap-held island for an invasion. After studying maps, Crane decided that a likely spot for the next landing would be off New Guinea, so he chose an island there called Halmahera. As soon as his story had started in the papers, the

Navy really landed on an island just four miles from Halmahera and an officer he met told him off before he learned that Roy had stumbled on the spot for his plot quite by accident.

What causes most of his headaches, Roy says, are tiny details of planes, ships, uniforms, and jargon. He draws planes from models when he can, because photographs never show them at quite the right angle. Once he had an assistant make a model when he couldn't get one any other way.

When Roy was starting "Buz Sawyer," he visited the Navy Department in Washington and was shown through the picture files. The Wave who escorted him assumed that he'd want a few pictures of the planes and ships he'd be drawing, but Crane also wanted background material. Finally the Wave asked him how many pictures he had

picked. "I didn't count them," he told her, "but I think between 800 and 1,200."

Troubles are uniform. Even with the photographs and with the sketches he's made on the spot on trips aboard carriers and visits to air stations, he still occasionally makes a slip. The two that brought him the most mail were both on uniforms. He once drew Buz Sawyer's blues with the five-pointed star on his sleeve turned so that one of the points was aimed squarely at the stripes. It should have been rotated a few degrees so that two arms pointed at the stripes. Another time he had a Marine with his tie tucked in. As thousands told him, Marines don't do that, only the Army.

Born in Abilene, Tex., and raised in Sweetwater, Roy attended Hardin-Simmons University for a year and the Uni-

[Continued on page 258]



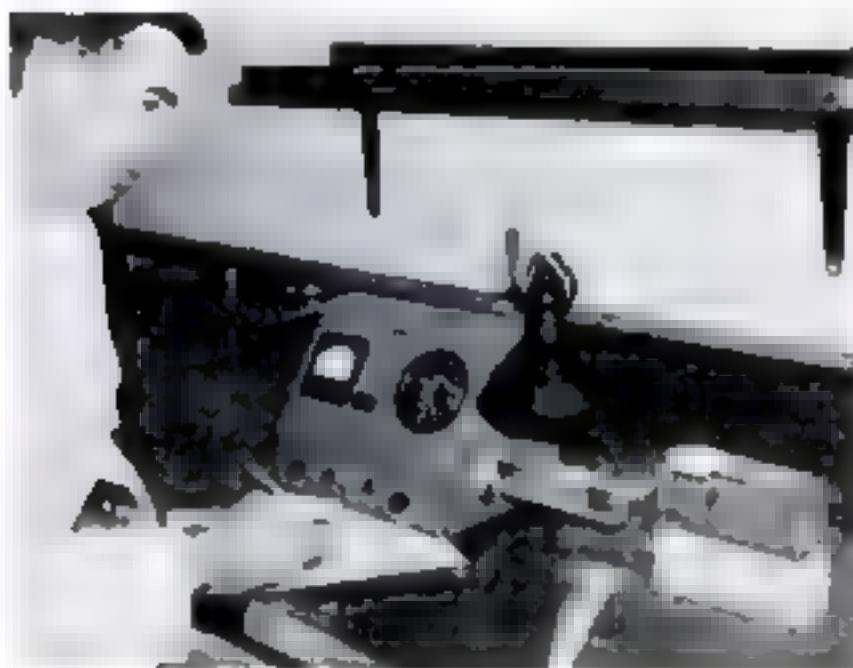
SCALE MODELS in Roy Crane's studio at Winter Park, Fla., help him keep his comic-strip drawings accurate. Here Crane is working out a sequence that shows the Pogo taking off from an icebreaker in the Arctic.



Gas-Turbine Generator to Bring Power to Disaster Areas

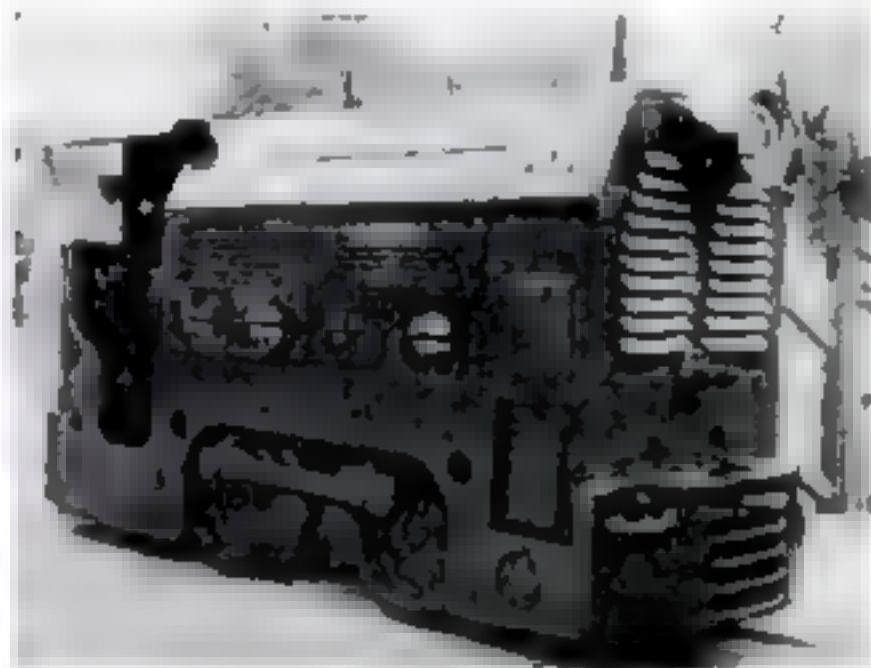
THIS track-riding power plant can roll into a town crippled by flood, fire or hurricane and turn on the lights in the homes of 20,000 people. A Westinghouse gas-turbine generator, it is now under

test by the Corps of Engineers at Fort Meade, Md. For Army use, the two railway cars have interchangeable axles, wheels and brake lugs so that they can be used anywhere in the world.



"Ouch Meter" Tests Pain Killer

WHITE rats are helping lab men test pain killers. Stimulated by heat, a drugged rat (in the cage at right) moves his tail and a photocell stops a timer. By comparing reaction times, Upjohn technicians measure the effectiveness and dosage requirements of new analgesics.



Red Engine Goes Underground

THE tractor-size locomotive above will do most of its work underground, hauling coal from Czechoslovakian mines. The BND 15 is smaller but more powerful than older pit engines used in that country. The midget can be broken down into three sections in half an hour.



Aluminum Sports Car Has Roll-Away

A NEW "dreamboat," with probably the most European-like lines ever tailored into an American car, has been put on display by Pontiac. But everything else about the vehicle is strictly U. S.

It will delight people who like gadgets. It will baffle the purists among sports-car lovers. For that's what it's meant to be—a sports car. But look what it's got:

Item—an engine of over 300 hp.

Item—a transmission mounted behind the seats.

Item—twin bubble windshields.

Item—combination shoulder harness and seat belts.

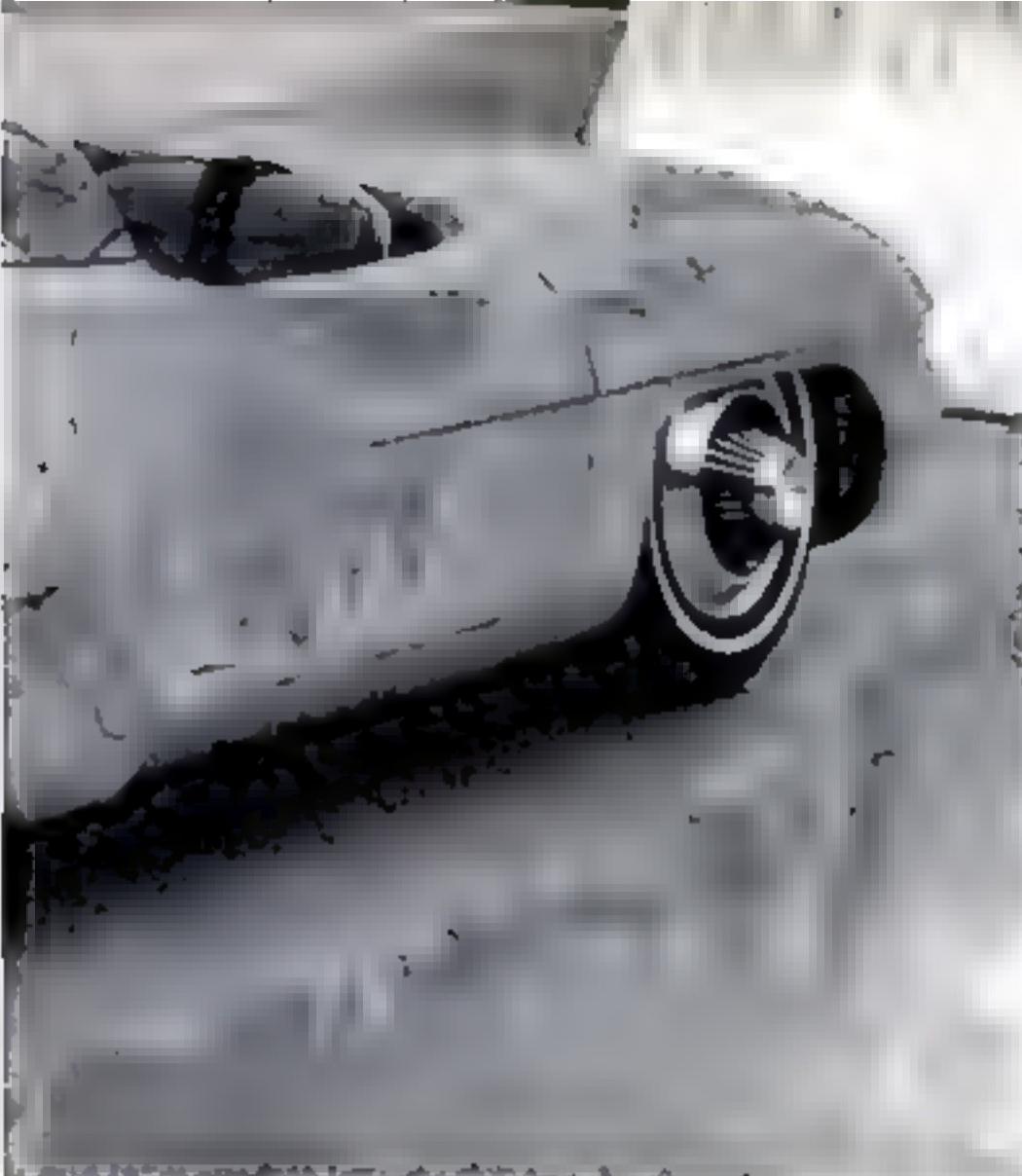
Item—controls recessed in the door panels and on a between-seats pedestal.

Item—a brushed-aluminum body.

Item—disappearing headlights.

Radio, ignition key share pedestal with gearshift lever. The crankshaft extension (center)





A ROAD-HUGGER, Club de Mer is only 38.5 inches high, 69.8 wide, 181 long. The engine has 10:1 compression, two four-barrel carburetors.

Lights

Item—a dorsal fin.

Except for the fin, the lines of the Club de Mer, as Pontiac calls it, are from a European drawing board. The car is described as "an experiment in simplified functional sports-car design."

Built exclusively for show purposes (as part of General Motors' 1956 Motorama), it stands only the slimmest chance of reaching a production line.

to a rear gearbox adds foot room.

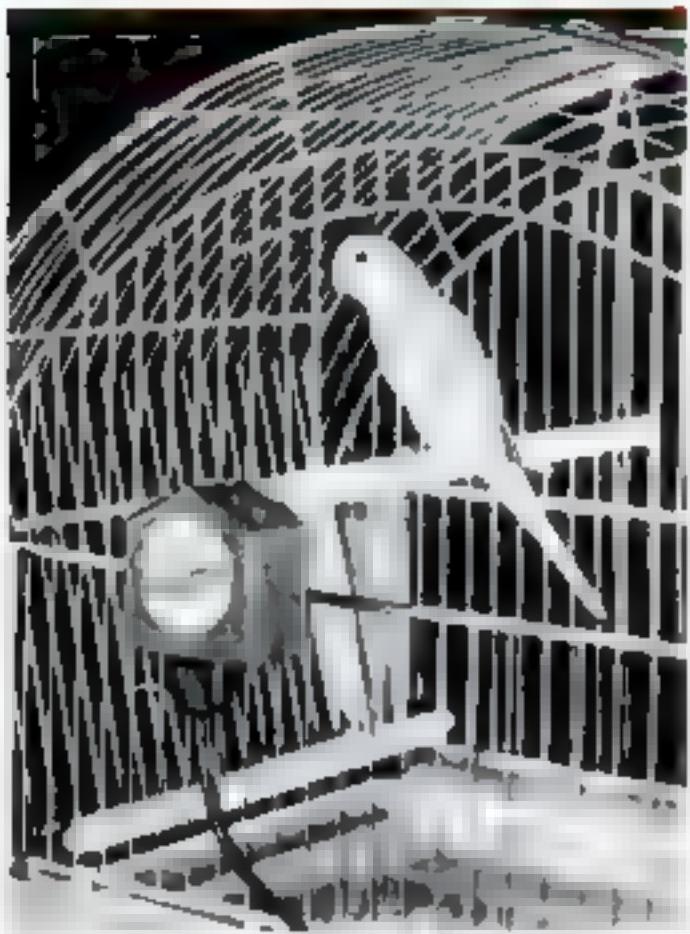
Shoulder harness and spring-steel spokes protect driver.



DISAPPEARING HEAD and parking lights revolve on a motor-driven pinion. The long aperture below them is an air scoop for carburetors.



New Aids to Living



1 Electrically heated perch helps birds keep warm on cool spring days as well as in winter. It plugs in. Your parakeet or canary regulates its own temperature by sitting near either the warm or cool end of the rod.



2 Music dampener lets the musician practice all he wants without alienating members of his family or neighbors. Acoustic enclosures, lined with sound-absorbing material, are designed for trumpet (above), clarinet, trombone, saxophone and other instruments. While the boxes deaden sound, musicians still hear their own notes.

3 Modular kitchens will be on display this spring and are scheduled for mass production late this year. Designed as free-standing units with their own interior walls, they will be attached by a

home builder directly to the wall struts and leveled on a floor rail. The parts include built-in counters, cabinets, range, refrigerator, freezer drawer, radio and even a cigarette lighter.





4 Flexible doorstop will bend to advancing equipment and make life less painful for passing ankles or a child at play. The little rubber bumper also protects the wall from a thumping doorknob.



5 Matching switch plate is made by inserting a piece of drapery or wallpaper behind the clear-plastic plate of this one-button, tap-on-tap-off light switch. It connects to wiring by screwless terminals.



6 Pocket socks combine utility and style for the bobby-soxer set. The knitted pockets are extra cuffs just below the tops. They have enough tension and depth to hold a latchkey, lipstick and small change.



7 Meat thermometer turns off the oven automatically when the roast is done. The thermometer, standard equipment with a new electric range, is set for the way you like your roast—rare, medium or well done—and plugged into a socket in the oven wall. A signal light goes on to let you know when the oven shuts off.



8 Furniture template lets you trace and cut out furniture shapes, scaled $\frac{1}{4}$ inch to the foot, for use with a room plan of the same scale when you want to change an arrangement. One template includes stencils for most of the furnishings usually found in a living room, bedroom, dining room and kitchen.

Further information on the products shown on these pages can be obtained from: 1. Drexel & Richmond, 321 Medical Center Bldg., Eugene, Ore.; 2. Acousti Practice Co., P.O. Box 2248, Cleveland 9; 3. Frigidaire Division, General Motors Corp., Dayton 1, Ohio; 4. Apco Hardware Mfg. Corp., 43rd Valley Blvd., Los Angeles 32; 5. Minneapolis-Honeywell Regulator Co., 2751 Fourth Ave., S., Minneapolis 8; 6. Bronx-Knot Hosiery Co., 350 Fifth Ave., NYC 1; 7. Alternator Division, American Motors Corp., Detroit 32; 8. A. Lawrence Karp, 16 Putnam Park, Greenwich, Conn.



What Goes On Inside an Oil Derrick Setting a New Record

This driller's-eye view (looking up) was taken inside the derrick over the Richardson & Bass well in the Louisiana marshlands as the old depth record of

21,482 feet was passed. In the left foreground is the traveling block on which the casing (from a 20-inch diameter at the top, down to seven) is suspended.



Driver Rides High in New Truck

The cab is mounted high over an underfloor diesel on a new truck designed by Henschel of Kassel, Germany, for carrying iron beams. Windows at the corners under the windshield give the driver a chance to see the road below.



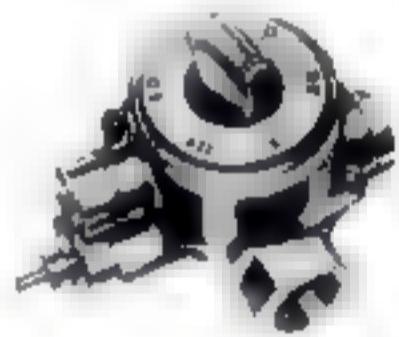
Mobile Radio Talks 2,000 Miles

The new Army ride-talkie above, used in jeeps, trucks and tanks, sends and receives messages within a 2,000-mile range. The operator need know only which knob to turn: the station tunes itself and its antenna automatically.



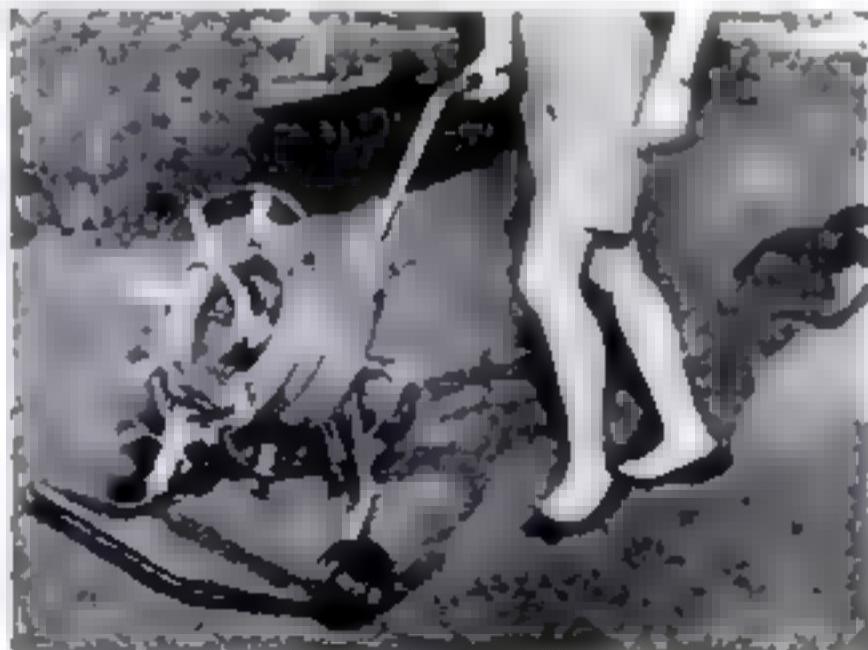
1. Power tap keeps a mower earning its way when it's not busy cutting grass. The flexible shaft couples to the crankshaft of most power mowers to run such attachments as hedge trimmers, other garden tools, or a buffer to polish your car.

2. Water timer turns off a sprinkler system so that you don't have to stick around to tend it, or worry about forgetting it.



Set up for a quick shower or for a long downpour, it shuts off the water automatically after any number of minutes up to a full hour.

3. Hose caddy rolls easily from one outdoor tap to another. A connector hose running from a faucet to the hollow axle of the cart lets you unreel the hose while the water runs. The reel holds 200 feet of plastic hose, or 100 of rubber hose.



New for Gardeners



4. Push-button bomb treats rose bushes with a combination wet-dry spray. A liquid insecticide fights pests, a fungicidal dust wards off disease. The light-colored dust serves as a tracer, making it easy for a gardener to cover the target.



5. Triple trimmer has a swivel locking arrangement for switching handles so that you can do three jobs—lawn edging, lawn and hedge trimming—with one tool. The cutting blade is double-locked on the shaft for added safety when the $\frac{1}{2}$ -hp. motor spins it at 17,000 r.p.m.

Further information on these products can be obtained from:
1. Rocklin Mfg. Co., Sioux City, Ia.; **2. Kaye & Miller Mfg. Co.**, 9426 W. Jefferson Ave., Culver City, Calif.; **3. Specialty Mfg. Co.**, 2356 University Ave., St. Paul, Minn.; **4. E. I. DuPont de Nemours & Co.**, Wilmington, Del.; **5. Strangers, Inc.**, 794 Central Ave., Highland Park, Ill.

Gus Drives A Bad Bargain

By Martin Bunn

WHEN Silas Barnstable, the town tightwad, showed up at Gus Wilson's Model Garage early one morning and announced that he was going to the city to buy a new car, Gus could hardly believe it.

"A new car!" Stan Hicks, Gus's helper, gasped. "I never thought to see the day."

"And why not?" Silas snapped, his wolfish features thrust over the door of his piston-clattering Model A Ford. "I know a bargain when I see one."

"Bargain?" Gus Wilson said. "But why drive 200 miles to the city, Silas? Our local dealers can take care of you."

"Hah!" Silas snorted. "They'd take care of me, all right, eyeteeth and all. I can beat their prices a mile. Give me five gallons of gas."

"Five gallons won't take you halfway," Stan Hicks told him, even though he knew the old reprobate's penchant for having an empty tank.

"Gas is a cent cheaper nearer the city," Silas announced with satisfaction. "I aim to get my money's worth."

"Can you beat that?" Stan Hicks said as Silas drove away with a grinding of worn gears.

"Well," Gus chuckled, "he did buy three gallons more than usual, and gas is a cent cheaper nearer the city. He'll save



"Fifty dollars," Silas shouted into the wind,

Karl Quincy

five cents, all told, on gas. I wonder how much he'll save on the car?"

GUS thought about this as he worked, knowing that there were certain car lots in the city that stocked standard makes of new cars, even though they were not authorized dealers. These cars were often advertised at reduced prices.

The night was wind-blown, with a spattering of rain, when Gus came back to the Model Garage after dinner to work on a rush job he'd promised out. He had finished the job and was cleaning up when the telephone rang. Picking up the receiver, Gus heard Silas Barnstable's thin voice over the wire.

"How much will you charge, Gus, to



"and they didn't fix it!"

come out and tow me in? I'm 10 or 15 miles out on the main highway.

Gus sighed. "Let's not worry about charges now, Silas. I'll be right out."

Gus found Barnstable standing beside a new sedan, parked on the highway shoulder. Silas was waving his arms, the wind whipping an ancient slicker about his skinny legs. Gus backed the tow truck into position and set out red flares while Silas trotted beside him chattering incoherently.

"Fifty dollars," he shouted into the wind, "and they didn't fix it! I'll get a lawyer, I'll sue, I'll—"

"Slow down, old-timer," Gus said soothingly. "What's the trouble?"

"I bought this car spanking new, mind

you," Silas declared. "I was on my way home when it quit on me. There I was 30 miles from a garage. I walked to a farmhouse—darned farmer charged me 30 cents to phone the garage at Six Corners."

"Thirty cents," Gus said. "Then what?"

"Feller towed me in," Silas' voice took on a note of hysteria. "He charged me 50 dollars—50 dollars, mind you—to tow me in and fix things, and here I am again. Wait until I see my lawyer."

"Six Corners," Gus said. "Hmm, that's about 60 miles back."

RECALLING Silas' penchant for putting in two gallons of gas at a time, Gus snapped on the switch and looked at

the gauge. It showed that the tank was about a quarter full of gas.

"How much are you going to charge for a tow?" Silas demanded.

"May not have to tow you," Gus said. "There can't be much wrong with a new car like this. What did the Six Corners mechanic find wrong?"

"How should I know?" Silas wailed. "He towed me in to his garage, fiddled around under the hood for a while, then ended up by charging me 50 dollars and sending me on my way."

"Not too bad a charge," Gus commented, defending his colleague, "for a 30-mile round trip on a rainy night."

"But he didn't fix it," Silas protested. "I'm stuck again."

Gus made a routine check of ignition and timing, and when he couldn't start the car, pulled the air cleaner and squirted raw gas into the carburetor throat while Barnstable turned the motor over. The car started instantly, ran smoothly, then died.

"Gas trouble," Gus said flatly. "Maybe I'd better tow you in."

When they arrived at the Model Garage a check of the fuel pump showed that it was in good working order, yet when the line from it to the carburetor and gas filter was disconnected and the motor turned over, it would throw no gas through the tubing. Either the gas gauge was wrong, and there was no gas in the tank, Gus thought, or there was some foreign substance stuck in the gas line between fuel pump and tank. Gus disconnected the line and applied his air hose to it, while Stan Hicks listened at the rear of the car.

"There's gas in the tank," Stan announced. "I can hear the air bubbling into it."

"Fine," Gus said, having killed two birds with one stone. If the gas line had been obstructed, it was now cleared.

Gus blew enough air into the tank to

build up air pressure and then removed the air hose from the gas line. Air pressure in the tank forced a stream of gas back through the tubing. Gus hastily clamped a horny thumb over it to halt the flow and re-attached the line. Then he started the car easily.

"Well," Silas said caustically, "You finally fixed it."

"No," Gus told him. "Whatever was in the gas line is now back in the tank. I'll have to drain and clean out the tank, or you may stall again shortly."

"Oh, no you don't," Silas declared, hastily getting behind the wheel. "You fellers are all alike, always trying to work one job into three. I'm going before I get cleaned any more."

SILAS got his new car as far as the gas island. Then the engine quit on him again.

"We'll have to clean out the tank, Silas," Gus said grimly, as he and Stan turned to and pushed the car back in out of the rain.

Now what, Gus, asked himself, could be in the tank of a new car that would so quickly stop up the gas line again?

Maybe he'd have to take the tank off entirely, and then Silas would really scream. Gus hesitated before going back to work on that tank. Something was nagging at his mind.

"Let's blow out the gas line again, Stan," he said finally.

This time when he had blown out the gas line, forced the gas tank full of air pressure and removed the air hose, he didn't put his thumb over the flow of gas from the disconnected line. He let the fuel run a moment, watching it thoughtfully. One good hunch deserves another, Gus told himself.

"Let's shove her out to the pumps again," he told Stan, "and fill her up."

"You'll just have more gas to drain out

[Continued on page 248]





TWO BIG DOORS open the end of our 14'-by-18' plastic greenhouse, converting it to a semi-outdoor play or sitting area. You can see how we attached the inner ends of the rafters to the house by nailing them to a 2"-by-6" spiked to the wall. By opening the doors here and casement windows at the other end, we can cool the greenhouse quickly. Plastic side panels are 8' lengths cut in half, providing 4' sections without waste above the 3' knee wall. Two rows of 8' panels cover the roof.

How We Built a Plastic Greenhouse

By Jerry Parker

WE BUILT a greenhouse the easy way—with big, handsome sheets of plastic that you just nail up and forget. Actually, we like to call it our sun room because it's so warm and bright and pleasant that it can be used as an all-purpose extension to the house.

You have the fun of growing plants and flowers all year round if you have such a room. On cold or rainy days, it's a cheerful sitting room, or a





1 ABOVE-GROUND FOOTINGS, 12" wide and 10" deep, were plenty sturdy in our mild California climate. In cold areas, or to meet building codes, extend footings below frost line.



2 WE POURED CONCRETE, then set in $\frac{1}{2}$ "-by-8" bolts to anchor the 2"-by-4" sill boards. Bolts, spaced every 3' to 4', were located to bring the sill flush with outer edge of footing.

semi-heated play area for weathered-in small fry. In hot weather, you can open it up to catch the breezes and bask in a covered patio with a built-in garden.

Our greenhouse is a simple lean-to design, with one side attached to the house and the other three walls resting on a light foundation. It's plenty spacious, too—14' wide by 18' long—yet the framing, siding and concrete cost only \$100. Depending on the price of the plastic that you buy, you can build one like it for \$300 to \$400.

Why plastic? The tough, translucent glass-fiber panels that we used are easier to work with and actually make a better greenhouse than glass.

We liked the corrugated type, which has a modern textured look, but you can also get flat sheets. Both come in many colors and are sold by lumberyards, building-supply dealers, and some building-material mail-order houses. Standard sizes are 26", 34" and 40" widths and various even-foot lengths up to 12'.

You can nail, saw, sand and shape the plastic like a piece of wood, using hand or power tools. By fastening the big sheets over a simple frame, you duck all the mess of cutting, fitting and putting in glass. Unlike glass, the panels are also practically indestructible. They're waterproof, rotproof, vermin-proof and even proof against slashing hailstones, errant golfers and little boys with slingshots.

Plants grow better. Many big-time commercial florists who must police and maintain barn-size expanses of glass are now using plastic because it also transmits a better balance of light, including ultraviolet and infrared.

There are no shadows in a plastic greenhouse. The sunlight, gently strained through the translucent fibers, is evenly diffused and distributed. You can grow both sun-loving and shade-loving plants side by side because the plastic prevents leaf burn. You can grow them at all levels, from floor to ceiling.

One nurseryman told us that plants which twist toward the light in shadowed glass greenhouses—a condition called phototropism—remain straight and healthy under plastic. Their blooms even show a brighter color and better texture because of the filtered light.

Choosing a color. Some makes of plastic, such as the Alsynite that we used, are rated according to their suitability for greenhouses. We selected a milkish-white panel that transmits 45 percent of the light and is recommended for bright sunny areas.

Several mild shades of green let more light through—from 50 to 60 percent—and are recommended for medium sunny areas and southern exposures in northern areas. There are also some nearly clear panels that transmit from 75 up to 90 percent, but these should be used only in



3 FOUR-BY-FOUR POSTS, 7' tall and 50" apart, support 2"-by-6" rafters on a 2"-by-4" plate. Inner ends of rafters rest on plate spiked to house 1' higher, pitching the roof downward.



4 STURDY CROSSBARS of 4"-by-4" stock were nailed into notches in the uprights. These were set 36" above sill to provide a nailing surface where siding and plastic panels meet.

areas that are extremely cloudy most of the time. Stay away from deep-tone colors that stop too much light.

Prices vary. There are about 500 square feet of plastic in the roof and side walls of our greenhouse, which will help you figure your own cost. In most places, you'll pay somewhat more than you would for glass, but don't forget that there's no breakage, no maintenance, a lot less work, and a lot more looks. Average cost is about 68 cents a square foot, with some mail-order houses selling the sheets for 50 cents a square foot. If you happen on a sale, as we did, you may be able to get the panels for as little as 29 cents a square foot, which is just about as cheap as glass.

Putting up the panels. The only cuts that you have to make are for the 45° bevel on the wall pieces where they meet the siding. You can cut the plastic with a handsaw, though it's a little slow going. If you have a portable power saw or a radial-arm saw with a full blade guard, you can fit it with a reinforced abrasive cutoff wheel of the type used to cut masonry. Do not, however, mount an abrasive wheel in a table saw as the panels are hard to hold steady, and there is danger of shattering the blade.

The panels are fastened on with 2" aluminum screw-shank nails that have neoprene washers. Nail every third or fourth corrugation across the width of



5 WE ADDED EXTRA BRACING at the corners this way. Lapped 2"-by-4"s fit neatly within 4" thickness of wall, are toenailed to the posts and to each other at points where they cross.

6 TWO-BY-FOUR PURLINS were fastened across the rafters to give a nailing surface for the plastic panels. You can space them up to 4' apart, but be sure that they fall at laps.



the panels and every 12" or so along side laps if they fall on back-up strips. Always nail through the crown or peak of each corrugation—it's hard to hit the heads in the valleys. You can pre-drill the nail holes if you like, but we found that it really isn't necessary. Any small cracks that appear around the holes are sealed by the rubber washers under the nail heads.

Using the greenhouse. Many fancy installations have roof ventilators, but we just open the doors and windows and the place cools down quickly. Whenever it gets especially hot and steamy—and it can—we hose down the walls. The garden hose also supplies other needed water, saving permanent plumbing.

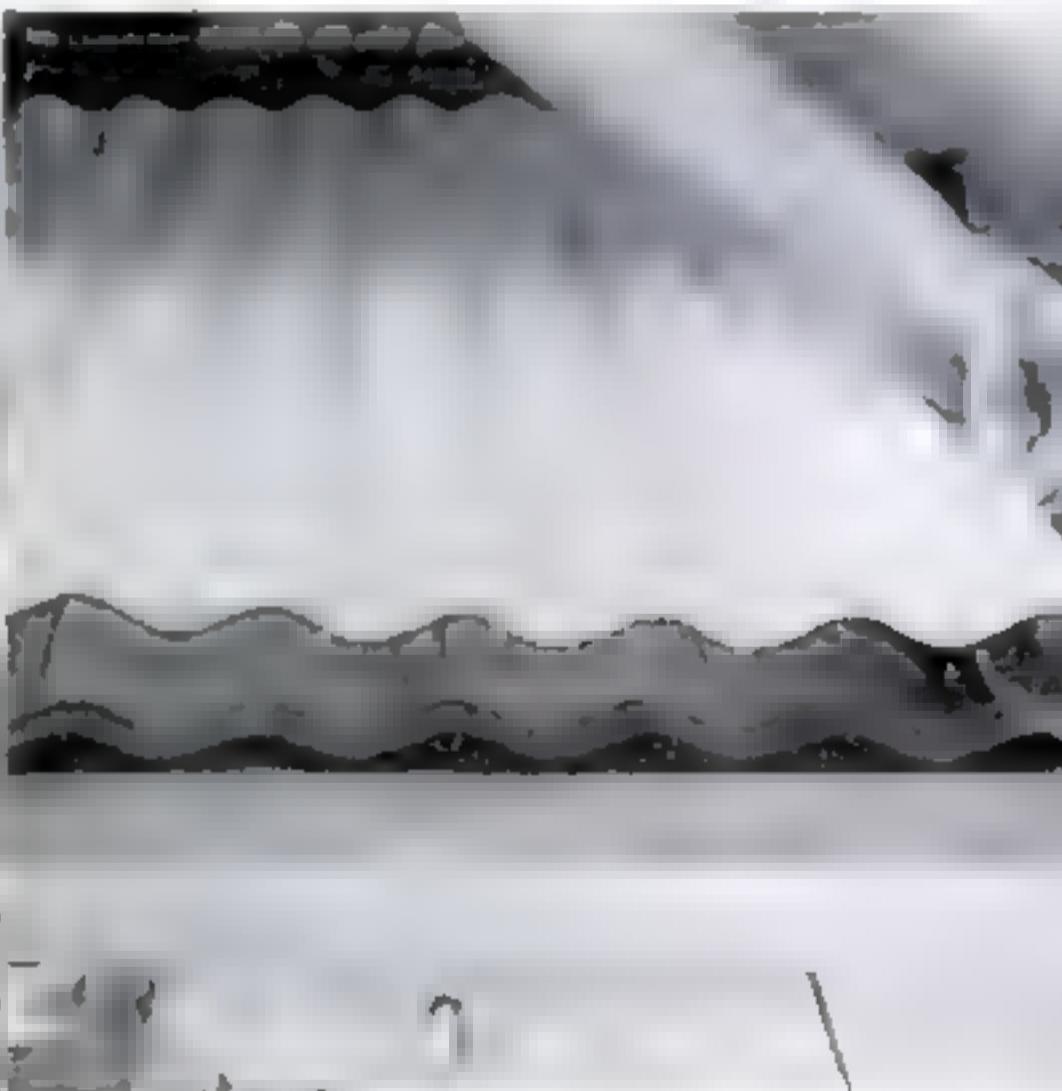
In chilly weather, one or two portable electric heaters, together with the radiated heat trapped from the sun, will give you just about all the warmth that you need. In cold climates, you may want to run a hot-water or steam line from your house, or add a couple of inexpensive radiant electric units or electric hot water radiators, which need no plumbing.



9 BEVELED SIDE PANELS fit snugly against the slanted $\frac{1}{2}$ "-by-3" sill, making a weather-tight as well as decorative joint. Top edges, cut straight, were nailed to the plate. Battens were nailed over the joints in the siding.



7 ROUGH BOARDS were nailed on vertically for a rustic half wall, with top edges beveled 45° to take a sloping sill. You could also put on shingles or clapboards to match house



10 RUBBER CLOSURE STRIPS, shaped to fit the corrugations, made it easy to build wind- and rainproof doors and windows. Frames were made of 2"-by-4"s, half-lapped at corners, and the plastic was nailed on through the strips.



8 ROOF PANELS are 40" wide by 8' long and didn't need to be cut to fit. We started the first row at the roof's low edge so that the next row would overlap it to shed rain. Always run

corrugations in the direction of slope for efficient drainage. We nailed the panels at the middle and ends, overlapping the sides one or two corrugations and the ends at least 6".

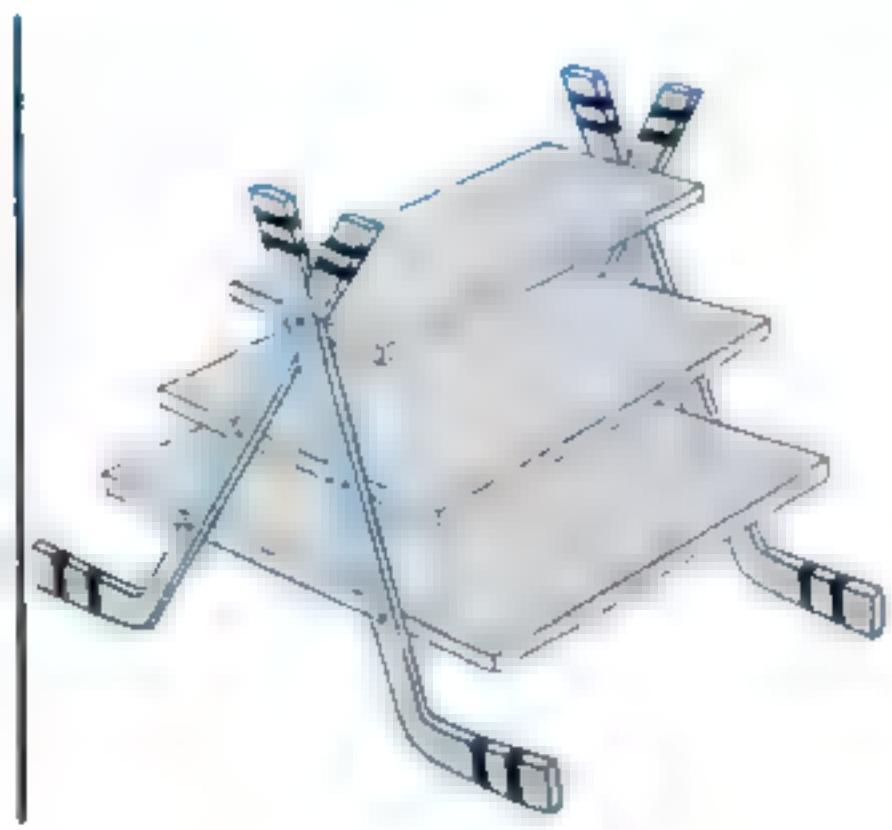
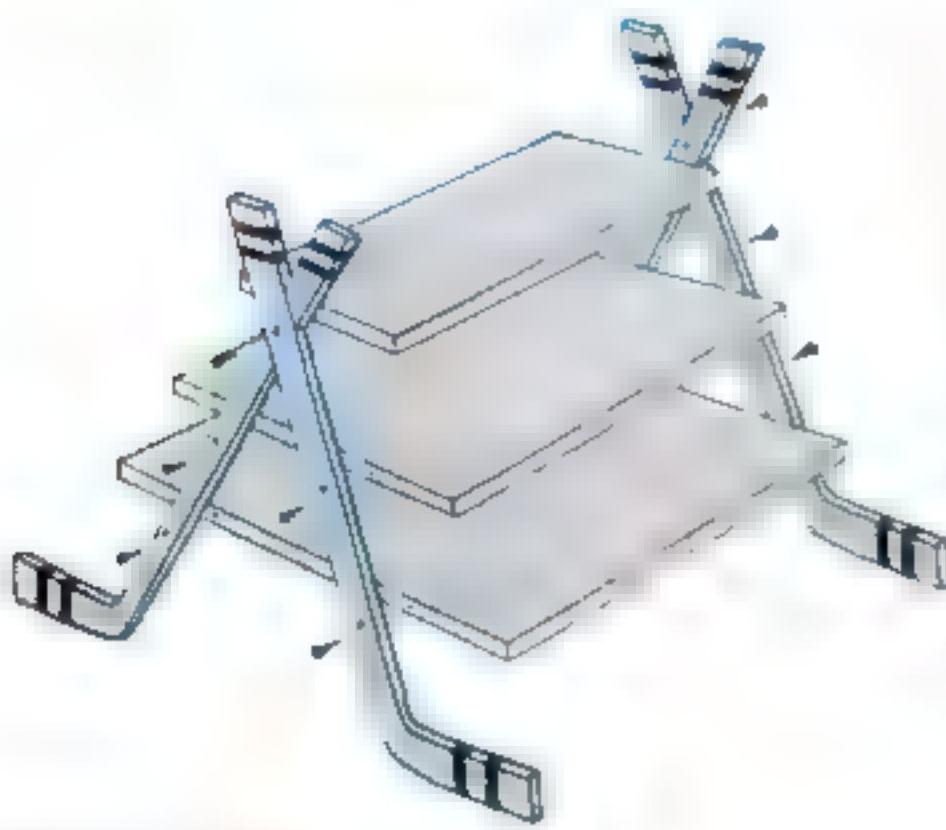
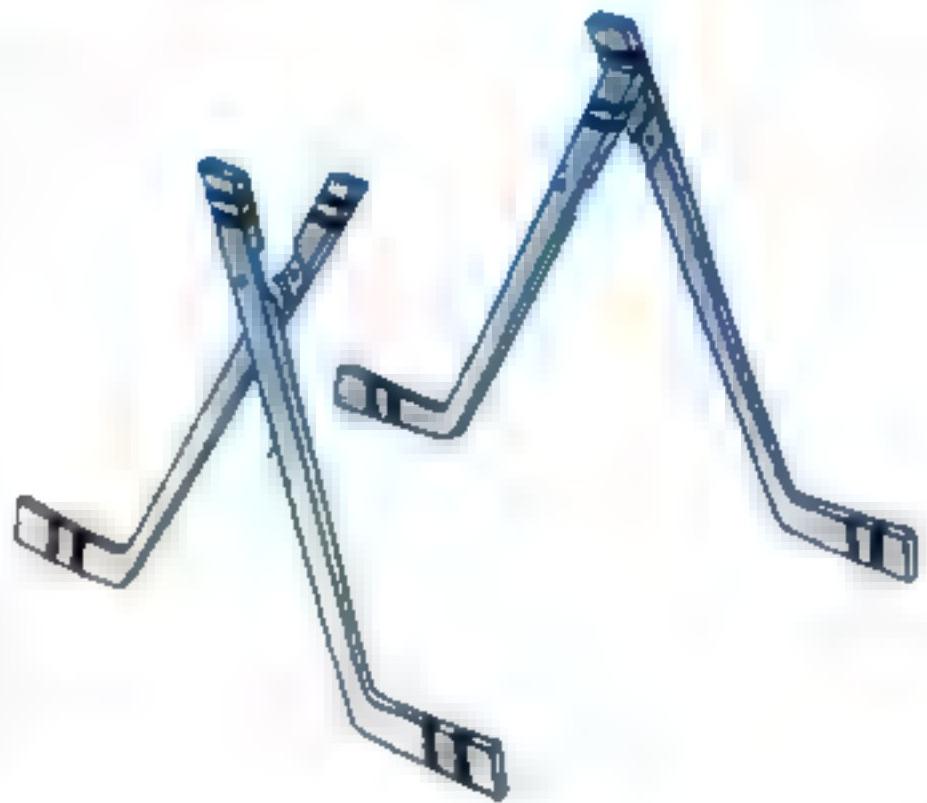
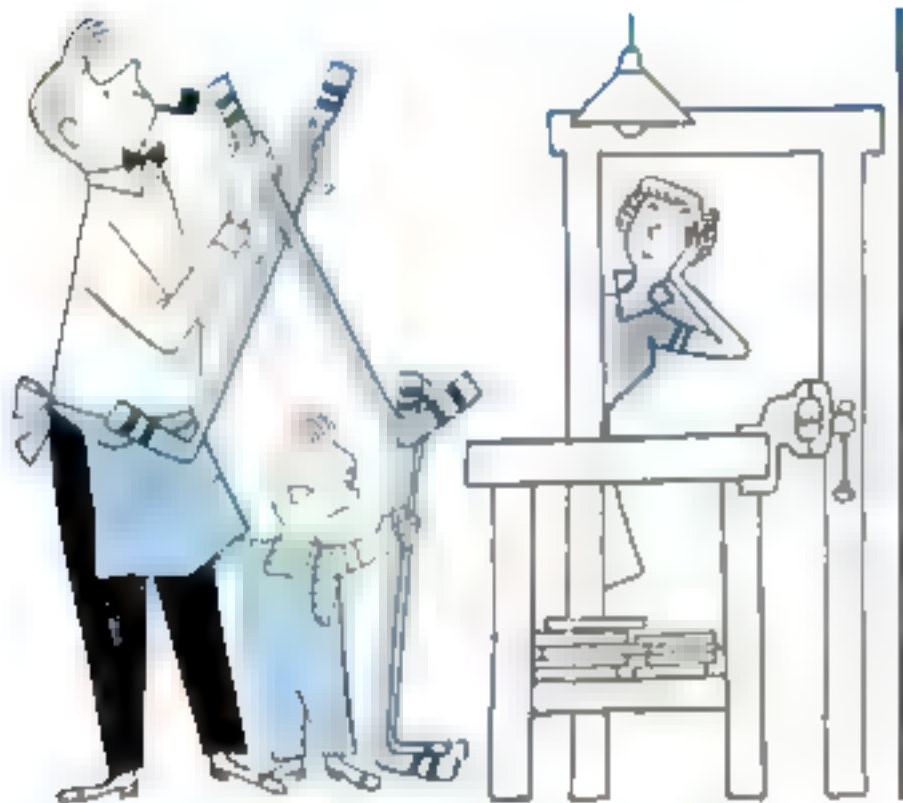


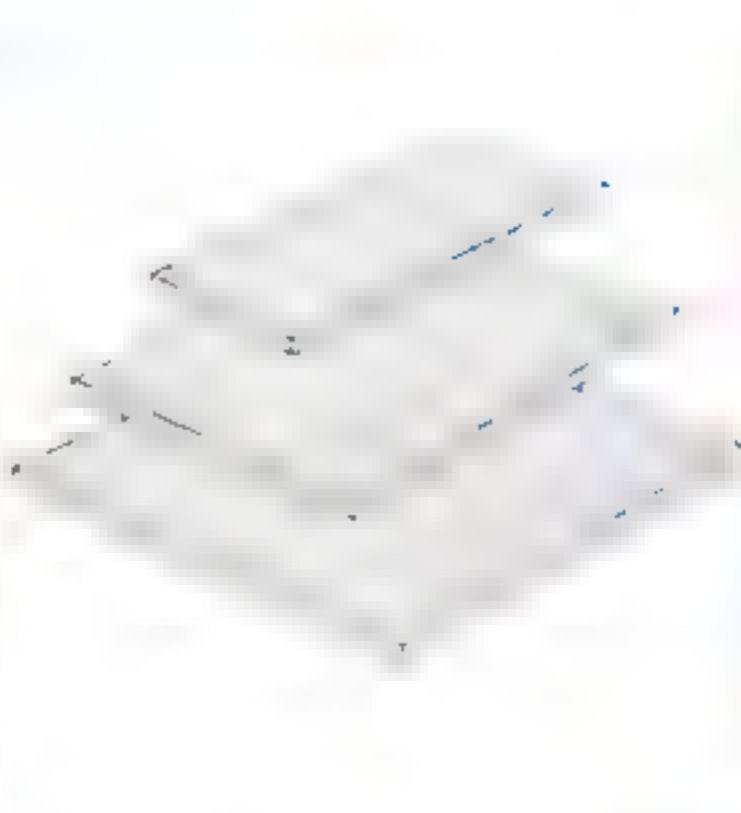
11 WINDOWS ADD VIEW AND AIR, making our greenhouse a sunporch, too. Rafters and purlins overhang walls 1' all around, with

rafter ends boxed in at the side. On the sloping end walls, we filled in the space at the top with short planks, cut to match the roof pitch. END

By Roy Doty

Wordless Workshop





Next Month: A rack to keep your fishing tackle stored neatly

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New for the Handy Man



2. Counter Tops Match Floors. Plastic covering for counter tops is now available in colors and patterns that match vinyl-plastic flooring for kitchen, bath, laundry and recreation room. The covering can be set with ordinary tools.

3. Lever Tool Pulls and Lifts. Using the spur-gear hoist below, you can uproot tree stumps, tighten fences or lift heavy loads with comparative ease. Turning the 12" lever handle provides pull at the hook end of the hoist. An automatic brake holds the chain fast.

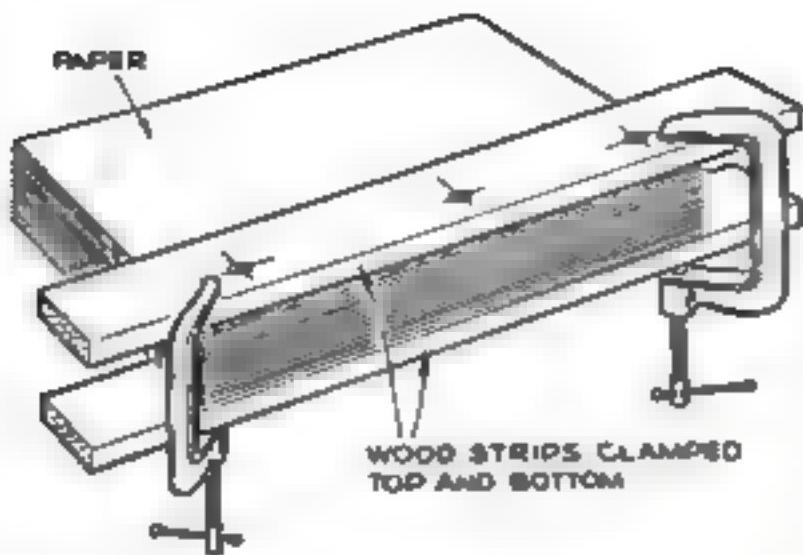


1. Trowel Machine-Finishes Concrete. After pouring a concrete basement floor, terrace or driveway, you can get a professional finish with the rotary trowel above. Controls in the handle adjust blade pitch for floating and finishing, regulate motion without stopping the motor. Many dealers rent the machines.



4. Bricks Are Nailed On. You can nail real brick veneer to any nailable surface through predrilled holes in these 1"-thick nail-on bricks. Overlapping lips form joints for mortar. The corners also overlap to make weathertight joints. The clay bricks come 2 $\frac{5}{8}$ "-by-8" or -11 $\frac{1}{8}$ " in size.

Further information on the products shown on this page can be obtained from: 1. Stein Rig Co., 313 State St., Binghamton, N.Y.; 2. Armstrong Cork Co., Lancaster, Pa.; 3. Manning, Maxwell & Moore Inc., Muskegon, Mich.; 4. Ludwiques Celadon Co., 11 E. Barker Drive, Chicago 1, Ill.



Drill Punches Holes for Binder

I HAD to bind 1,400 sheets of plain paper in a loose-leaf book, so I let my drill press do the punching job. I clamped the paper stack between wood strips, marked the hole locations on top, and drilled through wood and paper, easing the bit out occasionally. It took only two minutes to make 4,200 holes.—*Alfred E. Cavanagh, Carle Place, N.Y.*



Screen Doubles as Storage File

THIS screen conceals a wash basin in the office of Dowd-Swartwout Associates, Evanston, Ill., and provides storage space for large plans, drawings and supplies. The sides are tempered hardboard.

The end next to the wall rests on a board leg, while the wood-trimmed open end is supported by a piece of pipe.



Tube Gives Dowel-Peg Look

CIRCLES cut with a beveled tube give the effect of dowel pegs. Lay out logical points and rap the tube lightly over them with a mallet to form rings. Sharpen the tube by beveling the inside with a file.—*Frank A. Javor, North Bergen, N.J.*



Old File Helps Clinch Nails

HAMMER the projecting point of a nail over a worn triangular file, as shown above, for a perfect clinch. The nail won't back out from underneath and its point will go easily into the wood.

8 USES FOR Oil Cans



WINDOW-BOX
WATERING CAN



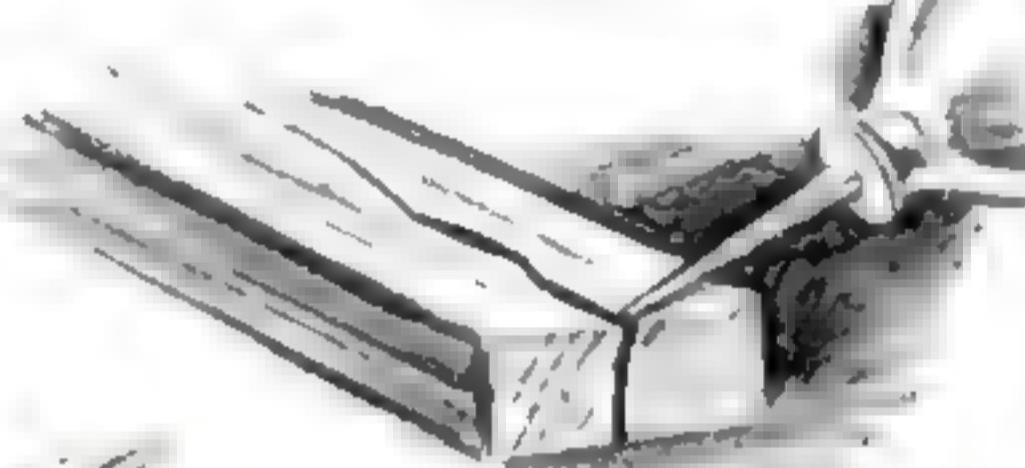
TOY JET
ENGINE



INKSTAND



SPILL-PROOF
AIR-RIFLE
LOADER



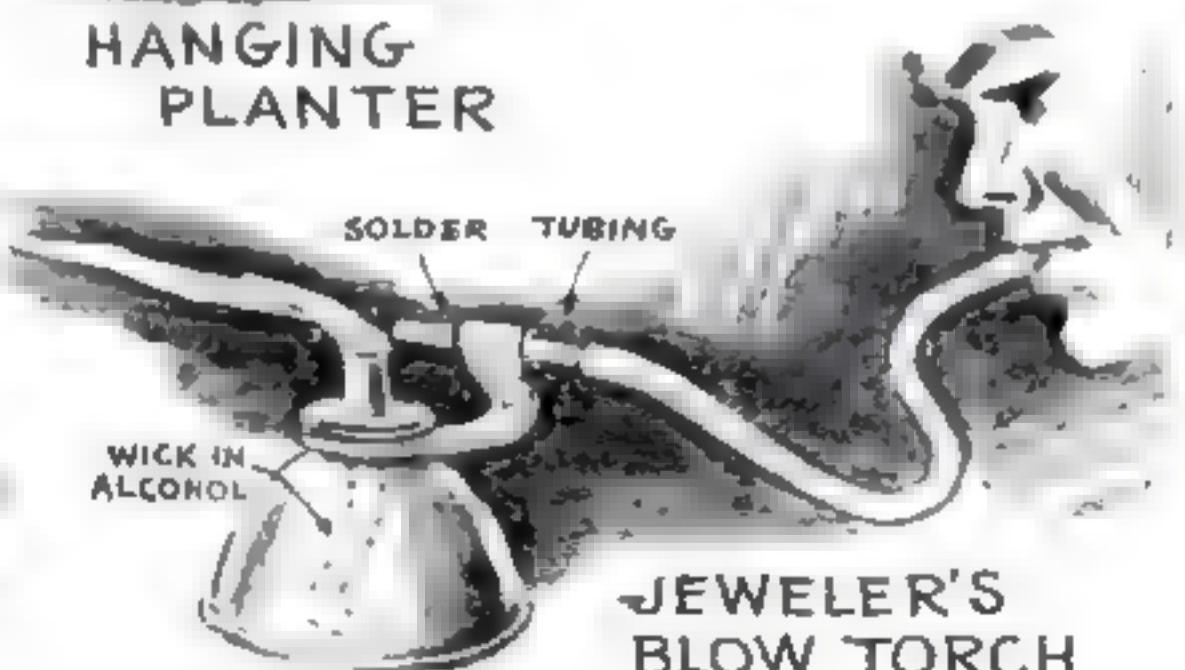
GLUE INJECTOR



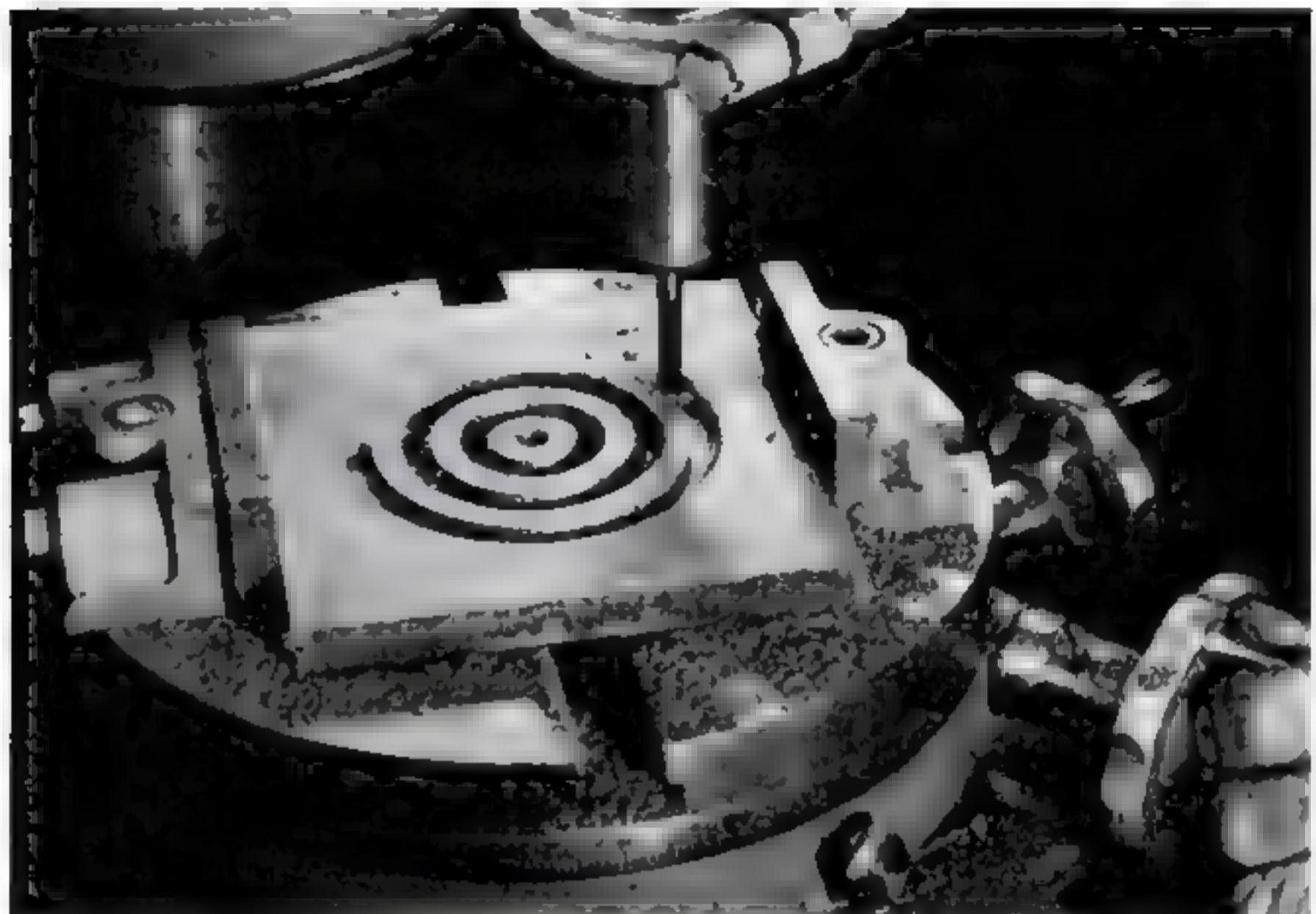
HANGING
PLANTER



CANDLE
HOLDER



JEWELER'S
BLOW TORCH

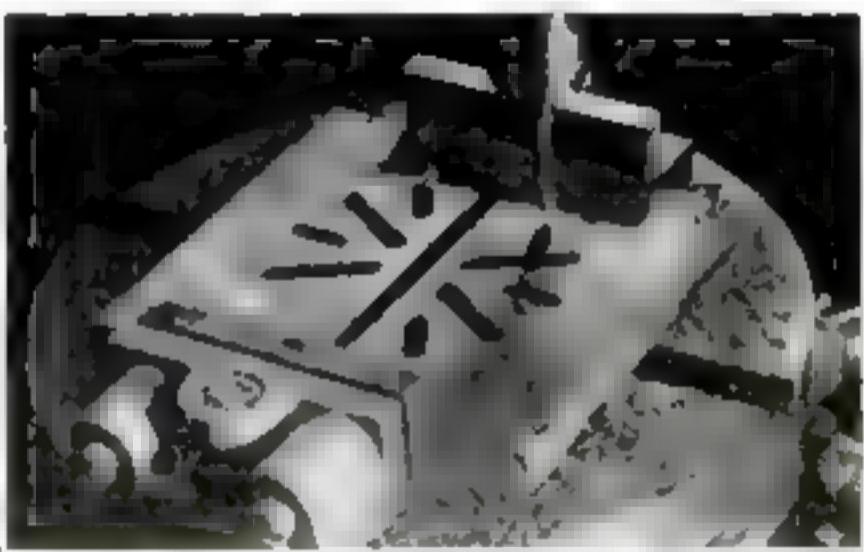


Cutting Grille Designs in Wood

By Walter E. Burton

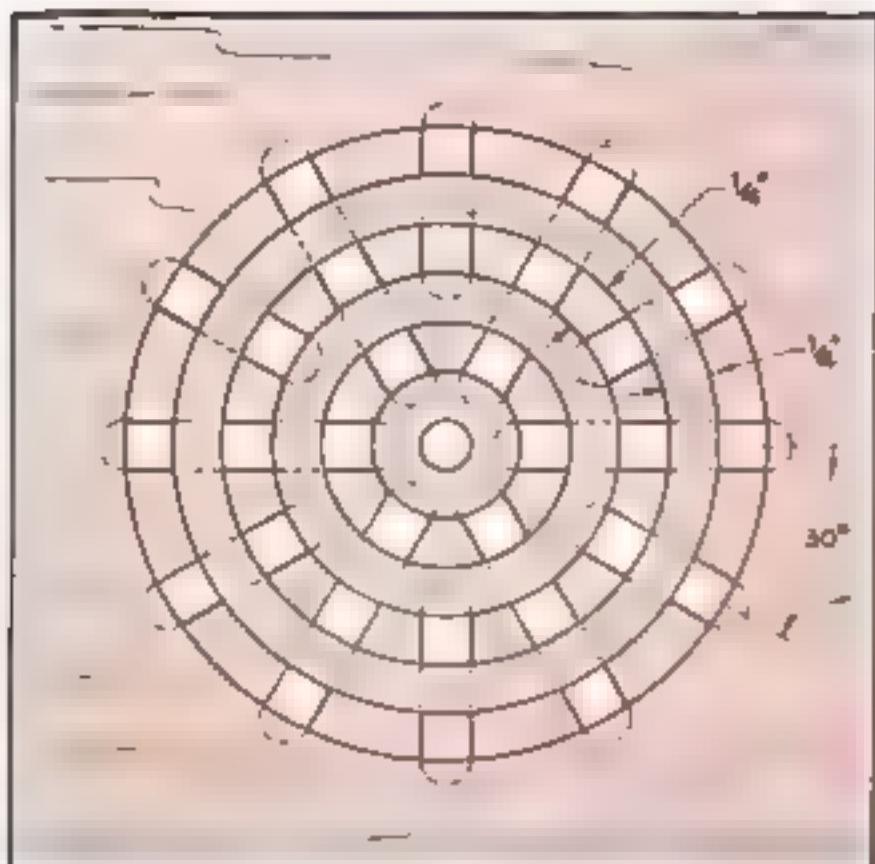
YOU aren't getting all you can out of a table saw and drill press unless you know the tricks of using them to cut decorative grillwork in wood projects. Loudspeaker openings and vent ports in cabinets are good spots for grilles. They can also be used as decorative touches for a variety of wood novelties.

Straight-line grillwork is the easiest to



GRILLWORK COASTER is a quick job when you use a drill press fitted with a rotary milling table. Increase the radius $\frac{1}{2}$ " between cuts, made with a $\frac{1}{4}$ " router bit. The piece is then turned over (upper right) and the reverse side routed in a series of radial cuts. Here the first cut was extended all the way across, but it could have been routed out in two parts, too.





LAYOUT FOR COASTER pictured on the previous page is shown above. Dotted lines show the grooves on back. Spacings are for $\frac{1}{4}$ " router bit.

make. Use a dado cutter on the saw—or the regular blade will do if you want narrow openings.

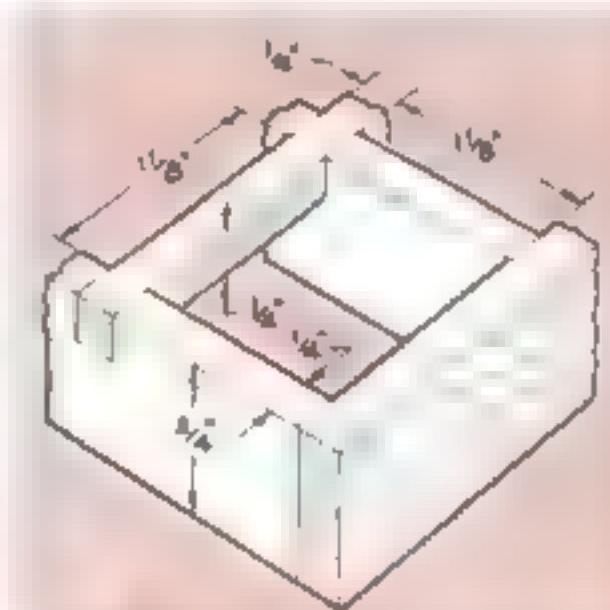
Cutting the grooves. First cut parallel grooves halfway through the wood from one surface. Then turn it over and cut grooves the same depth at an angle to those in the first surface. Openings result where the grooves intersect—square ones if the grooves are at right angles, diamond-shaped ones if the grooves intersect at a slant.

Slide the work along a guiding fence to make straight-line grilles on either a saw or drill press. A useful trick is to employ a number of spacing bars or sticks. You then make the first of a series of parallel cuts with several spacing bars between the edge of the work and the

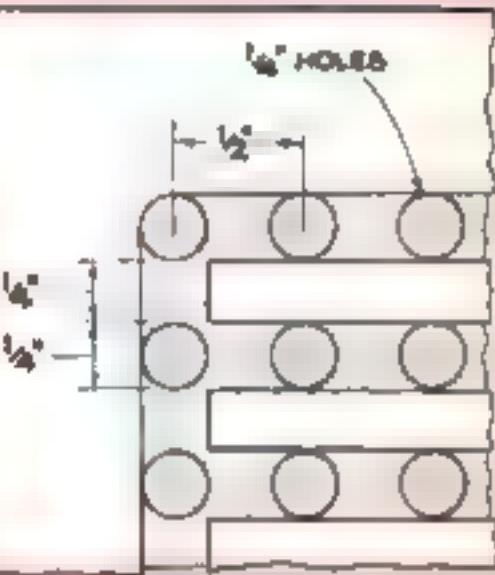
TWO WAYS TO MAKE A HOT-DISH HOLDER are shown below. The one in rear has two sets of dado cuts at right angles to each other.



BOARDS CLAMPED to saw table as above limited forward and backward movement of work while dado cuts were being made. Spacer strips of $\frac{1}{4}$ " wood were placed between the work and fence. One was removed after each cut, spacing the cuts accurately.



DETAILS for reproducing the lattice grille, on which teapot rests at left, are shown in the sketch above.



ONE TOOL, a $\frac{1}{4}$ " router bit, made both grooves and holes in this grille design. The panel was finished by scorching with a gas torch and then shellacking and waxing the surface.

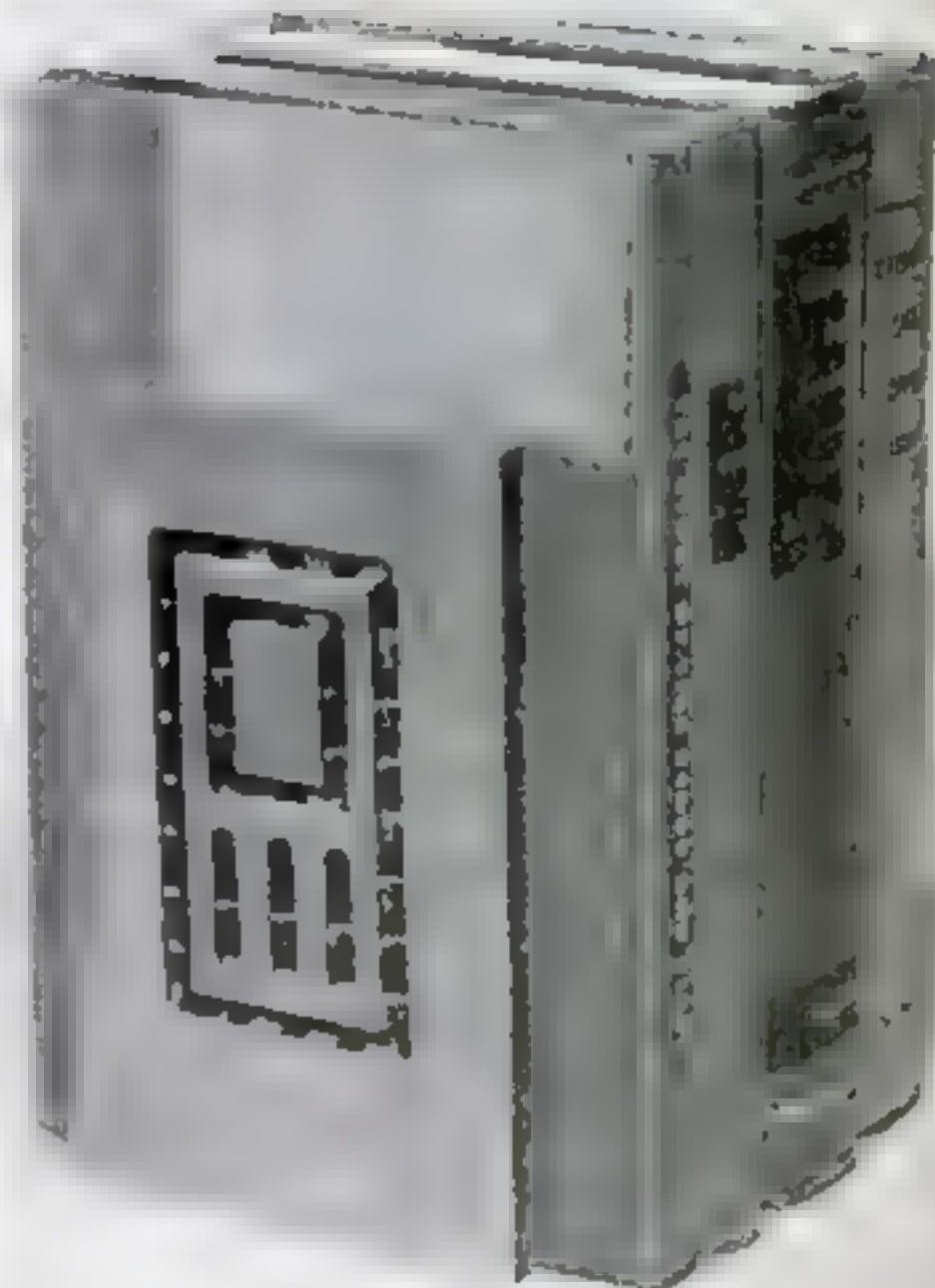
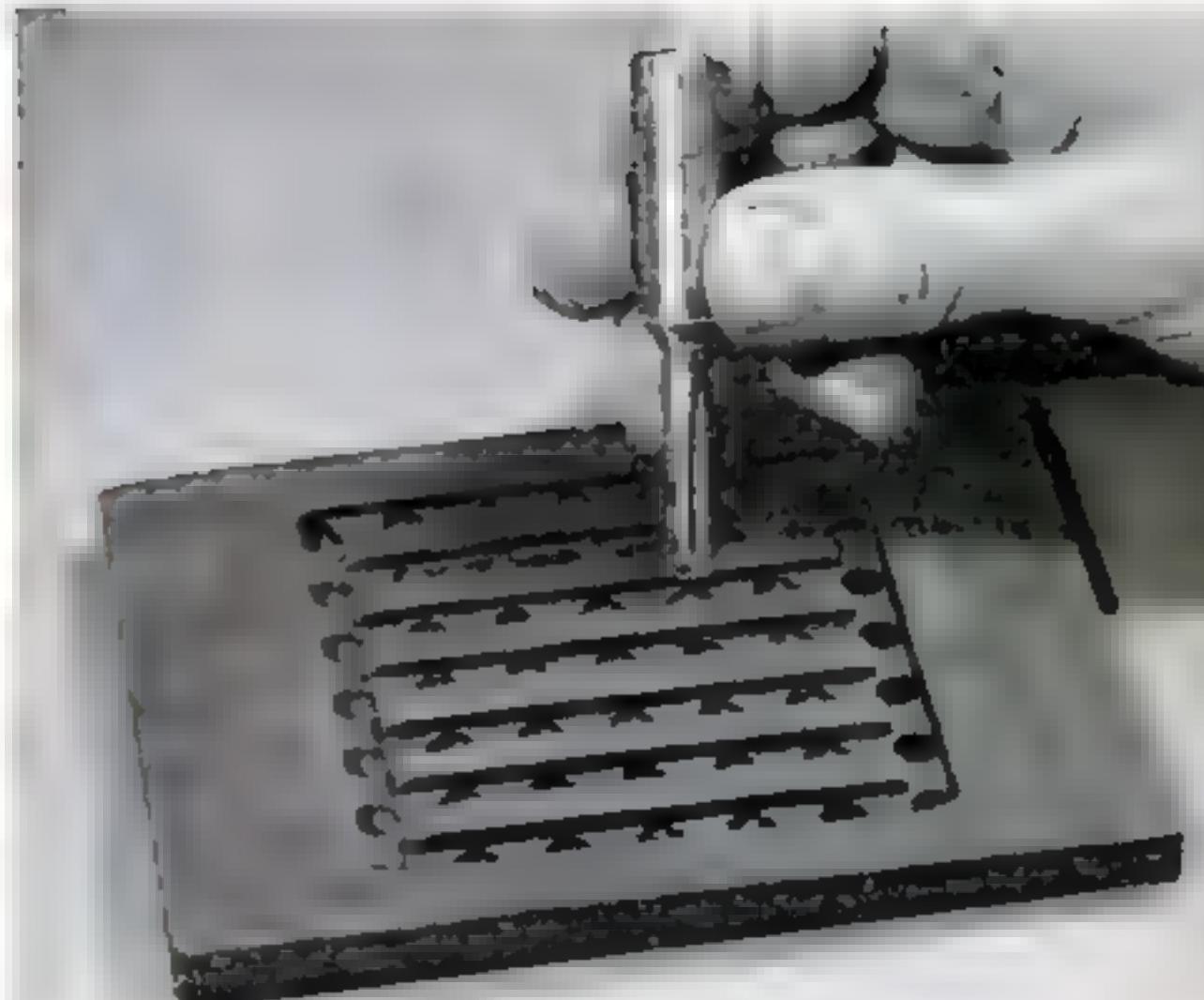
guiding fence. By removing one bar at a time, you position the work for the successive cuts.

Grille-making possibilities really open up when you chuck a router bit in a drill press. You can then cut in curves. These cuts can be made with great precision if the drill press is equipped with a rotary table that has cross and circular feeds controlled by micrometer screws.

Improvising a table. Circular cuts can be made without such a table, however. Just pivot the work around a nail or screw in a board clamped to the regular drill-press table. Between cuts, shift the work or its support laterally. Bore the center hole afterwards.

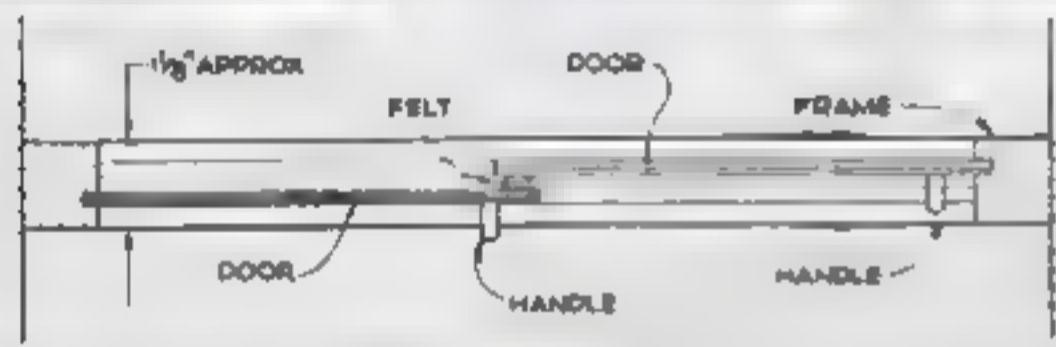
Sometimes you will find that the grooves cut on the back surface must take a particular pattern to produce openings that won't cause some of the front-surface detail to be insufficiently supported.

In all cuts, remember that the work must be held firmly and fed carefully and safely to the cutter—and that the cutter should be sharp and operated at recommended speed. Work a strip of abrasive cloth back and forth through the openings to smooth them.



BOOK END above was made with straight cuts of a $\frac{1}{4}$ " router bit in a drill press. The openings were squared by using a wood rasp.

Cabinet Built Over Doorway Provides Extra Storage Room



If you are cramped for storage space, you can build a cabinet over a doorway, as shown in the photo at left. The bottom and shelf are 1" lumber cut to fit. The door frame and wood cleats screwed to the wall support the pieces. A grooved frame cut from 1 1/2" stock takes hardboard sliding doors.

Lampshade Makes Flood Reflector

ORDINARY kitchen aluminum foil stretched over a lampshade frame will give you a good photoflood reflector. Strip the old fabric off and cover the back as well as the sides, leaving the socket ring on top open.—Robert J. Berkvist, Syracuse, N.Y.

Paper Clips Hold Data Cards

Two paper clips soldered to a 1 1/2"-by-2 1/2" strip of tin-can stock make a reading stand for file cards bearing shop data or cooking recipes. Solder the single-loop end of the clips to the strip, drill, and screw it to your file case. The holder will keep the data card off the work-bench or kitchen work space.



Level Line Kept from Sagging

LONG cords used to lay a level course of cinder blocks or bricks will sag unless supported at the center. You can do this at the height of each course with a matchbook (arrow) held between two blocks, as in the photo. The loose blocks are removed when the course reaches that point.—Michael Ligocki, Gary, Ind.

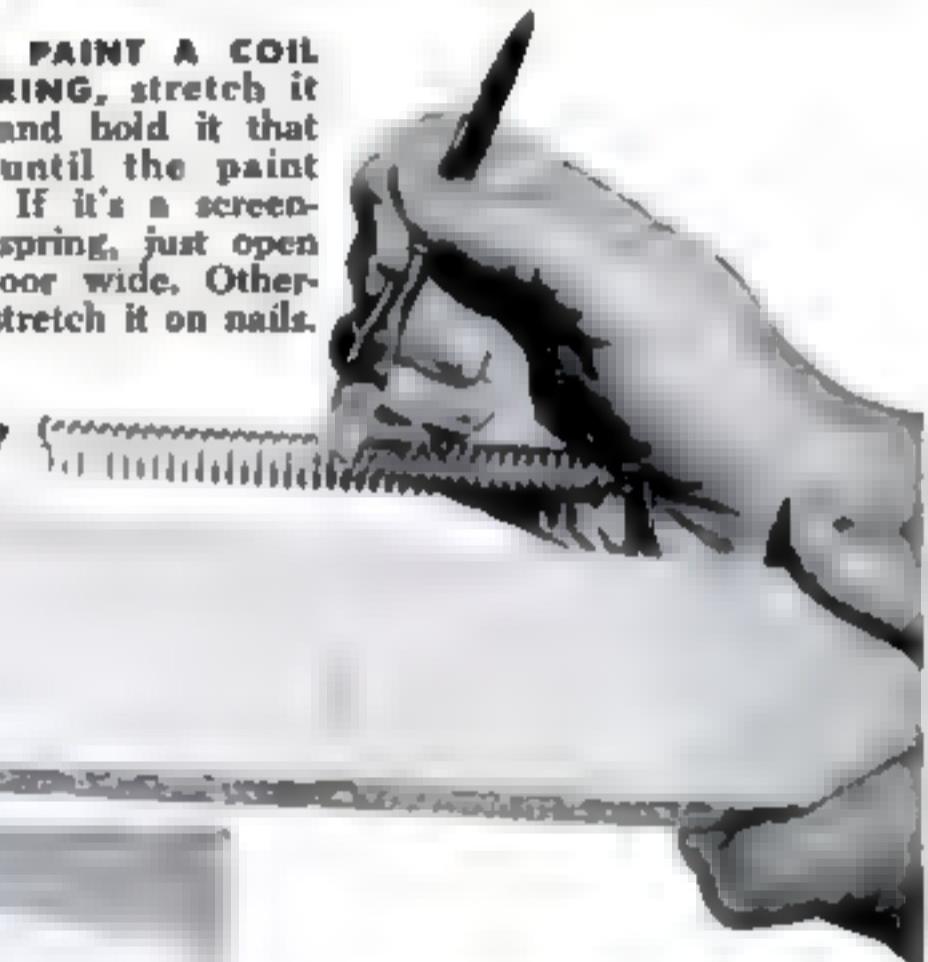




7 Tips for Painters

1 AN OPENER bolted to a frequently-used brush saves time. This one was made by hacksawing one leg from a flat corner brace and filing the end to the shape of a screwdriver tip.

2 TO PAINT A COIL SPRING, stretch it first, and hold it that way until the paint dries. If it's a screen-door spring, just open the door wide. Otherwise stretch it on nails.



3 PAINT PICTURE HOOKS to match the wall and they'll be less noticeable. For ease in painting, hook them over a scrap of wood.



4 TO CLEAN YOUR HANDS after a painting job, keep the solvent in a pump-type window-spray bottle.



5 AN EGG WHIPPER of the wire-webbed, dime-store type is a fine mixing tool for paint in a gallon can.

6 FOR A SMALL JOB, pour your paint into a cut-down milk carton. Discard it when you're through.



7 SPATTERS COME OFF easily if you coat doorknobs and other hardware with petroleum jelly before you begin to paint. You can also use rubber cement.



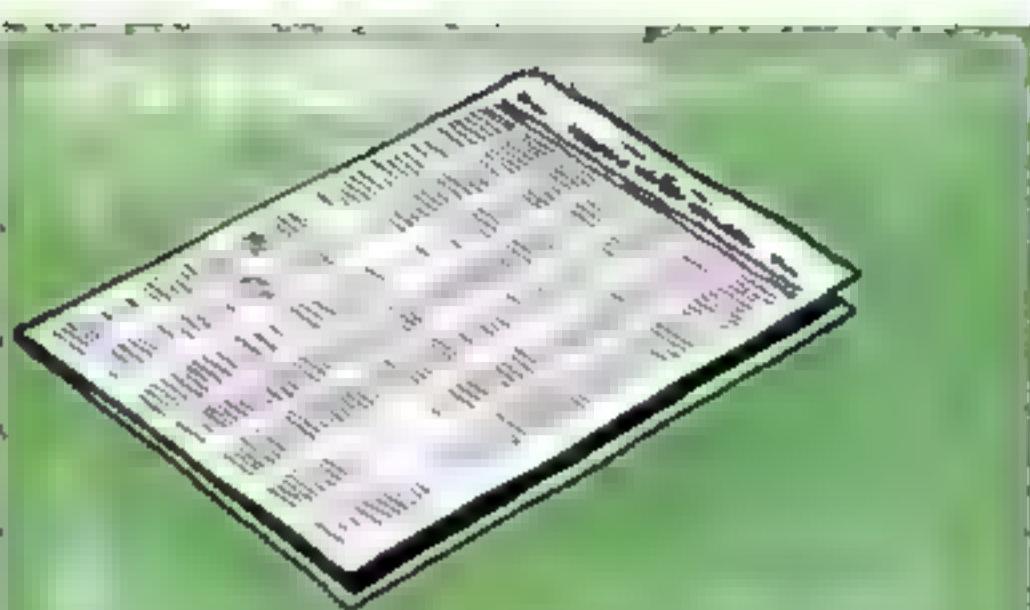
**Here's an old pressman's trick!
Before you start on that next
repair or painting job, learn . . .**

How to Fold a Handy-Man's Hat

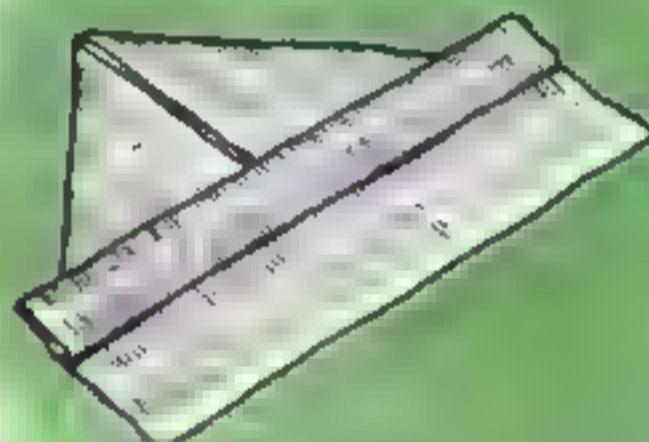
WHEN doing any job that makes dirt or dust fly, take a tip from newspaper pressmen and wear a paper hat. Light as a breeze, comfortably snug, and costing not one cent, the hat will keep paint, grease, sawdust and even cold drafts or hot sun off your head. Try one next time you paint a ceiling, clean the furnace or crawl under the car.

Fold a double sheet of ordinary newspaper as shown in the step-by-step drawings. Once you've caught on, it takes only a minute to make a hat.

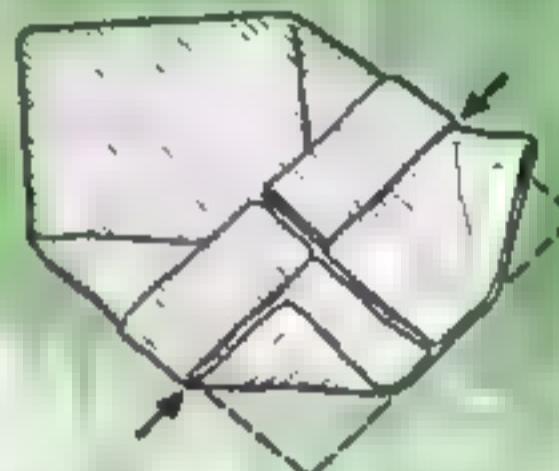
For a tighter fit or for a child's hat, make the folds in step 6 closer together. If your community has a tabloid-size news sheet, try it for making midget handy-man hats for the children's pets.



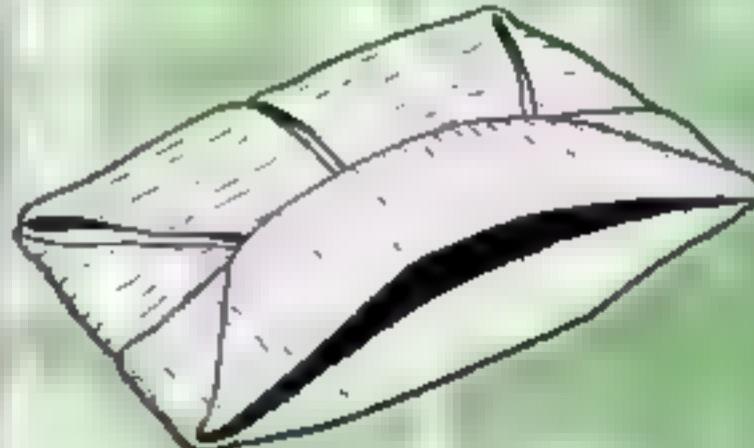
1 START WITH a single two-page sheet of standard-size newspaper. Lay it on a flat surface with the fold turned away from you.



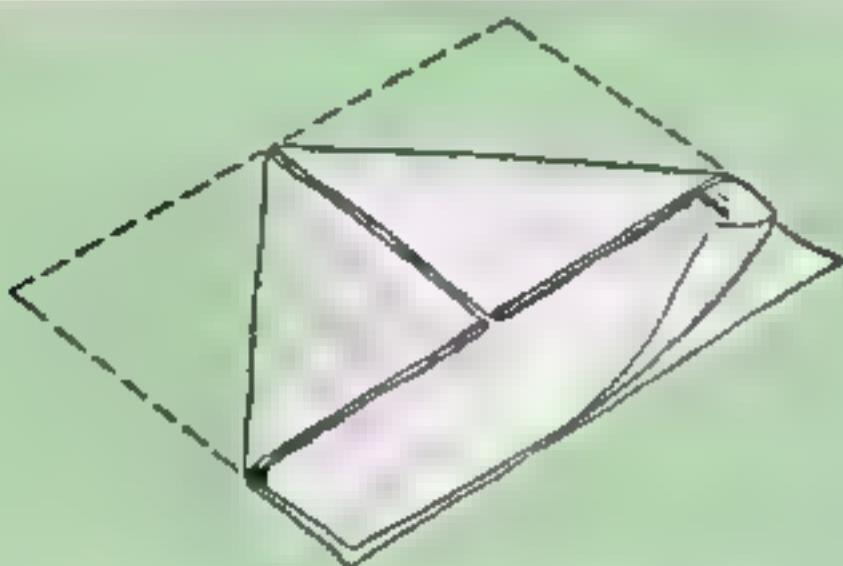
4 FOLD OVER the same piece a second time, this time along the line to which you brought the sheet's lower edge in the last step.



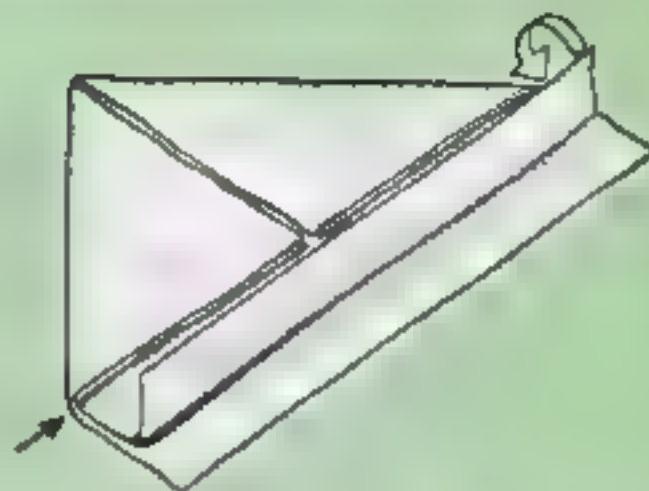
7 NOW TURN UP both lower corners to the bottom of the folded band. Crease well, and then, along line marked by arrows above . . .



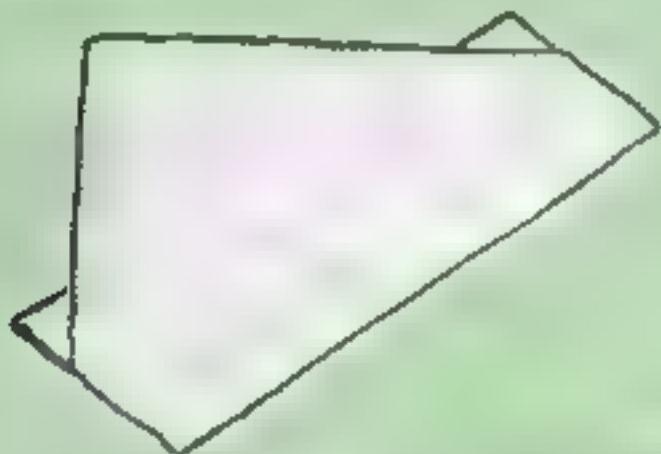
10 IT SHOULD LOOK LIKE THIS by now. To make the final square shape, put a hand into the opening, spreading the sides apart like this.



2 TURN DOWN the two top corners (from the folded upper edge) so that they meet evenly and the lower edges line up at the bottom.



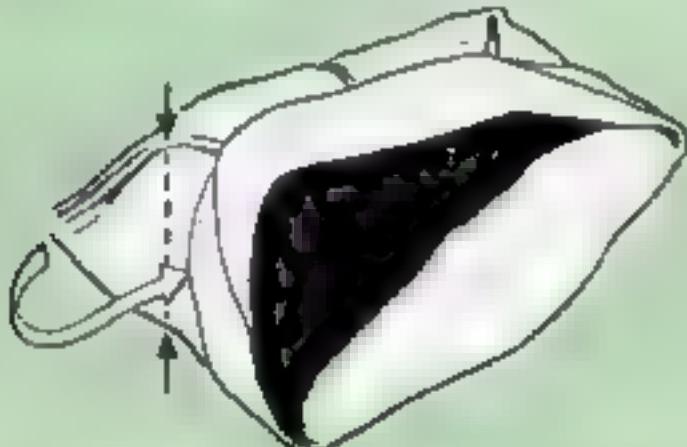
3 LIFT UP the single top sheet only, folding its lower edge up to the bottom of the folded corners (arrows). Crease it well.



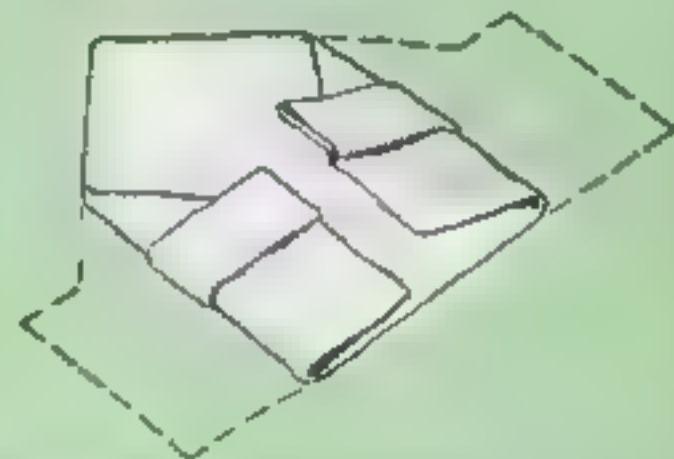
5 NOW TURN OVER the whole works, flipping it end for end. The point should still be away from you, as in the sketch above.



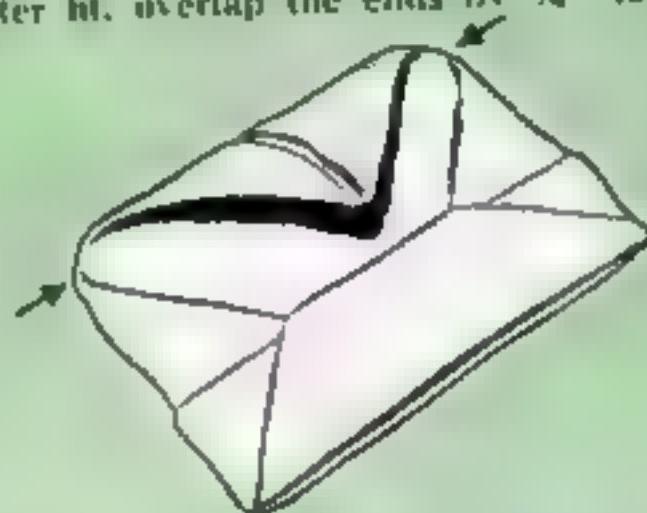
8 FOLD THE BOTTOM UP right across the band, crease, and tuck it around and under the band as indicated by the curved arrow.



11 OPEN ONE END WIDE, push a crease in with a thumb along the vertical arrows, and fold the point down, tucking it behind the band.



6 FOLD BOTH SIDES OVER equally so edges meet. This makes an average size hat. For a tighter fit, overlap the ends by $\frac{1}{4}$ " to $\frac{3}{4}$ ".



9 THEN FOLD THE TOP DOWN, creasing it in line with the two arrows to form sharp corners at both ends. Tuck it under the band also.

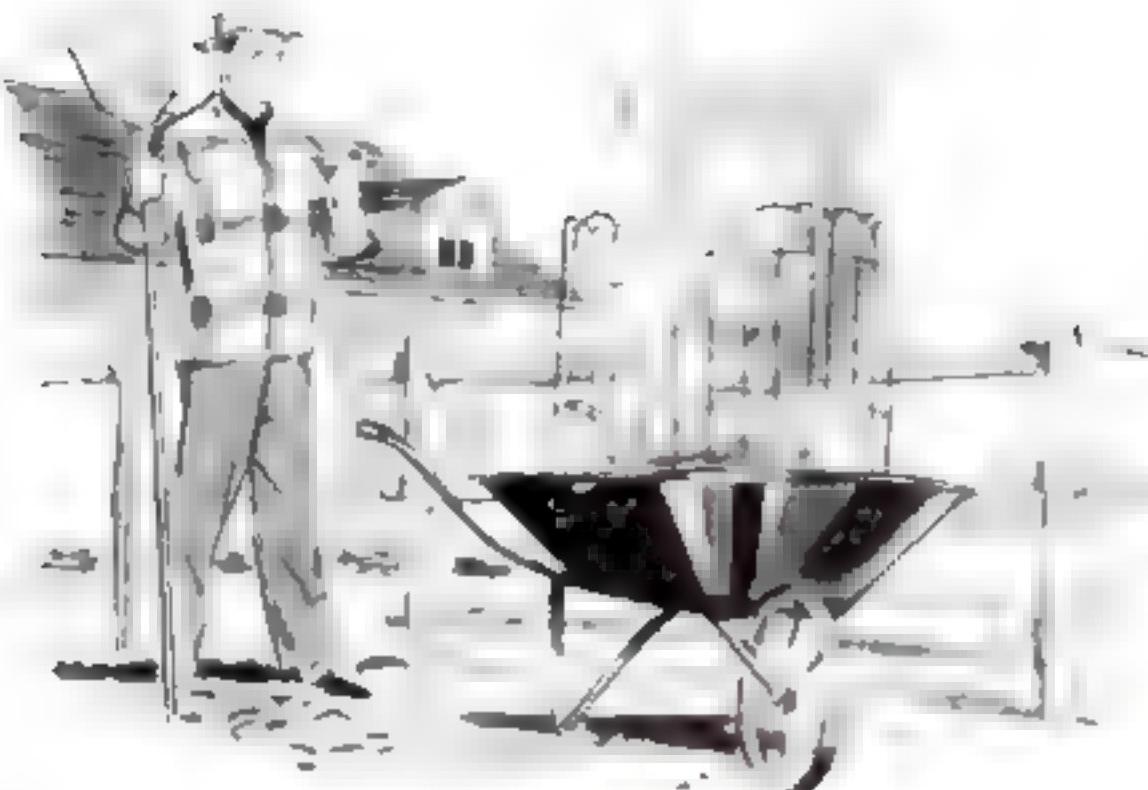


12 REPEAT STEP 11 at the other end. Then lay the hat upside down on a flat surface and crease the corners square on all four sides.

Barrow Burner Rolls to Trash

GARDEN refuse and leaves can be burned on the spot in a receptacle made of fence wire and fastened on a metal wheelbarrow.

Shape the wire to fit the flat bottom of the barrow. Fasten it with wire run through holes drilled in the barrow below the lip.—Bill Arter, Worthington, Ohio.

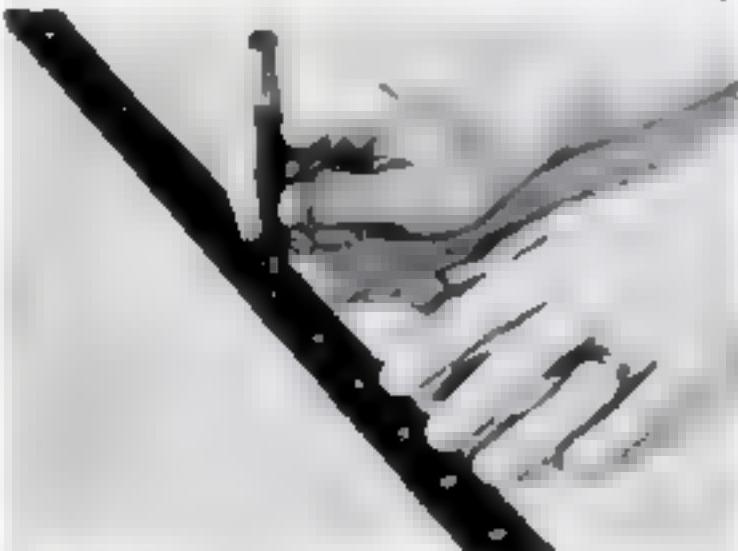


DO IT THE EASY WAY



INSTALLING AN EXTRA SHELF in a kitchen cabinet? Just rest each end on screw eyes.

WANT TO SPACE HOLES in a line exactly 1" apart? Use a strip of perforated hardboard as your gauge. A punch will fit the board holes for accurate centering.



NEED A BRACKET for hanging a wrench set on a perforated panel? Use dowels.

LOOKING FOR A FLOWER FROG for an odd-sized bowl or a vase? Make it from wax. Punch holes with a hot awl or pick.



Keeping the Home Shipshape



A SNACK BAR for your kitchen is right at hand if you have a sit-down ironing board that allows space for the knees. Cut a plastic cover to match the contour of the board and ask the seamstress in the family to sew on a stiff quilted border to serve as an apron.



WICKER AND REED can be cleaned with mild soapsuds if dirt is not deeply embedded. On stubborn spots, rub lightly with fine sandpaper. To keep the piece clean, when dry give it a coat of thinned white shellac.



A LINOLEUM CUTTER can be made by notching the end of a good putty knife. You'll find that it does a better job than an ordinary knife when you have to cut around pipes, sinks and other floor-based objects.

STOP SNAGGING CLOTHING inside clothes chutes and wooden laundry hampers. Sand down all rough edges that clothing might touch, and then polish with a good brand of paste wax.

More Home Tips



FAT LITTLE PIGS like this one pep up an Easter table or a youngster's basket. Cut off the points of chicken-corn candy for ears and snout, and use the flat ends for feet. Cement the candy and a pipe-cleaner tail to a tinted egg, and draw the eyes with a crayon.



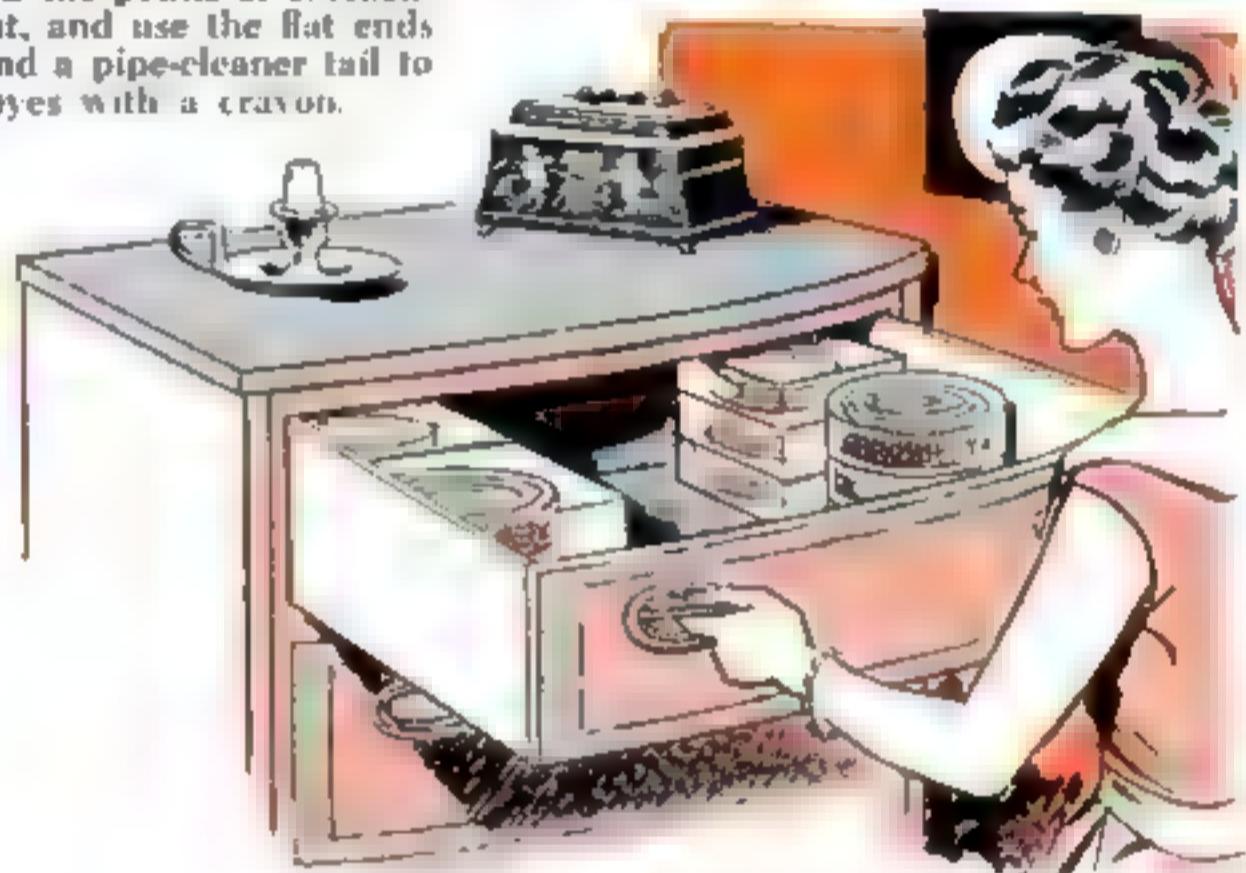
GLASS SPLINTERS that are too tiny for a broom to pick up can be wiped up with a couple of dampened facial tissues.



THERMOSTAT CLOCKS sometimes develop a noisy purr or rattle. Running a vacuum-cleaner brush attachment over the works will remove grit and dust that may be causing the trouble.



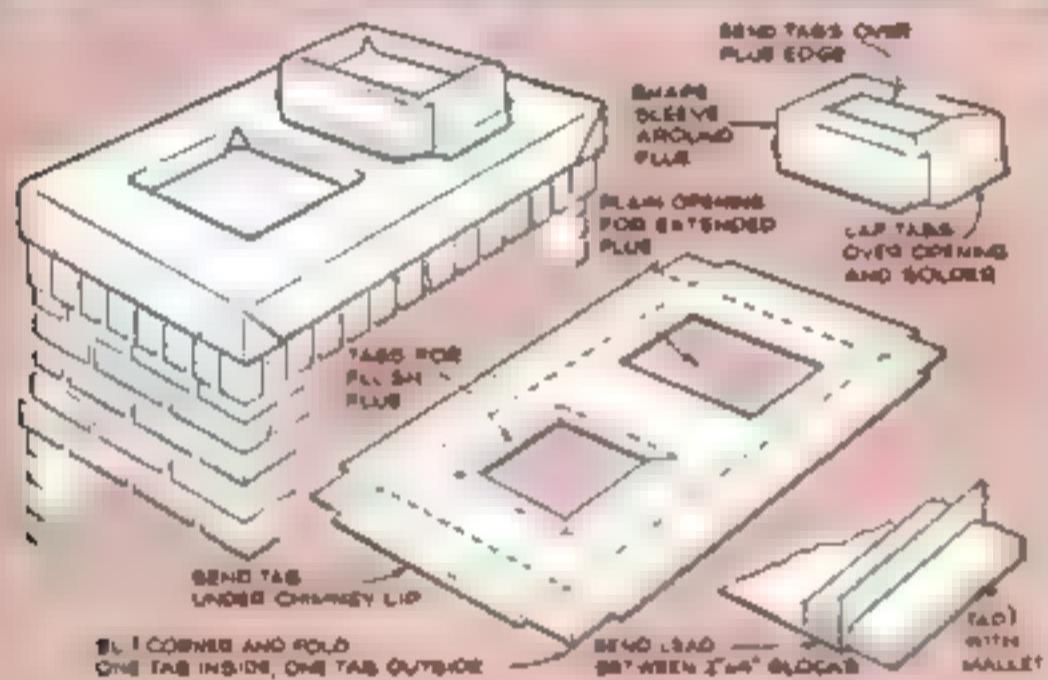
CHANGING A RIBBON on a typewriter doesn't have to be such a messy job. Next time you discard an old pair of rubber gloves, cut off the thumbs and first fingers and keep them handy just for this chore.



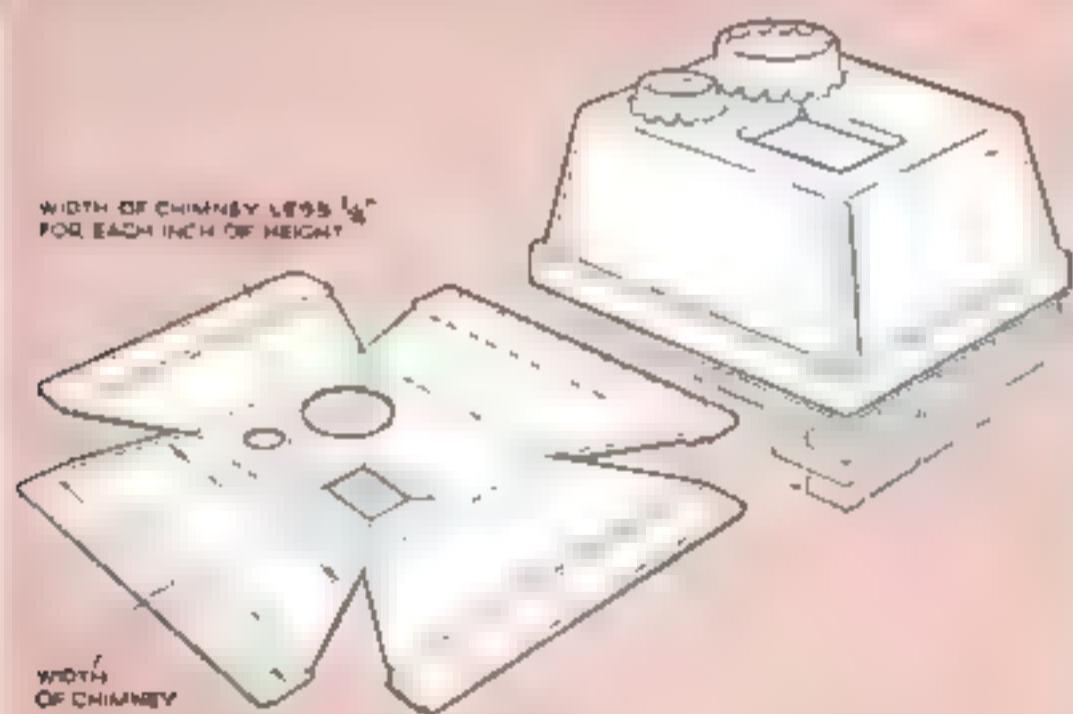
BELTS WON'T TANGLE in drawers or gather dust in closets if stored in plastic sandwich boxes or cheese boxes. You can stack the transparent containers so it's easy to pick the belt you want in a jiffy.



TO KEEP OUT DAMPNESS, wind and rain at a cellar hatch, fix a sponge-rubber door mat to the underside of the outer door. Fasten the mat to the wood with roofing-paper nails and metal disks, letting it extend 4" to 6" beyond the bottom of the door. This overlap folds down, sealing the door tightly when closed.



LAY OUT PATTERN from a paper template. Where flue tiles are flush with the top, bend tabs down inside. On tiles that extend above, solder on separate sleeves.



IF FLUES STICK UP too high for good appearance, you can shape a decorative cap around them. Build up a form of bricks and mortar to back up the soft lead.

Lead Cap Stops Chimney Leaks

THOSE handsome metal chimney caps, long used on expensive homes, are easy to add yourself if you use sheet lead. Lead gives a trim, rich look and protects a masonry cap from becoming cracked and weathered, causing leaks that are often difficult to find and expensive to repair.

You can snip the soft lead with metal-cutting shears and shape it easily. Lay out a pattern on heavy paper and make sure that it fits the chimney. Use either three-pound hard lead or four-pound soft lead, available at many plumbing stores and metalworking shops, and from roofing-supply dealers.

Solder or weld as many of the joints as you can before hoisting the cap to the roof. Any joints that must be made later can be pretinned and sweat-soldered with a small gas torch after the cap has been placed on the chimney.

Bend the lower edge under the chimney lip to hold the cap on. If there's no lip, you can bolt an angle-iron cleat around the chimney with masonry anchors. Bend the cap under it.

Three Methods of Mounting a TV Set

TABLE-MODEL TV sets often become orphan pieces of furniture which are just stuck anywhere that you have something to put them on. Frequently they take needed space from other furniture, interfere with room ar-

rangement, or aren't placed in the most advantageous viewing spot.

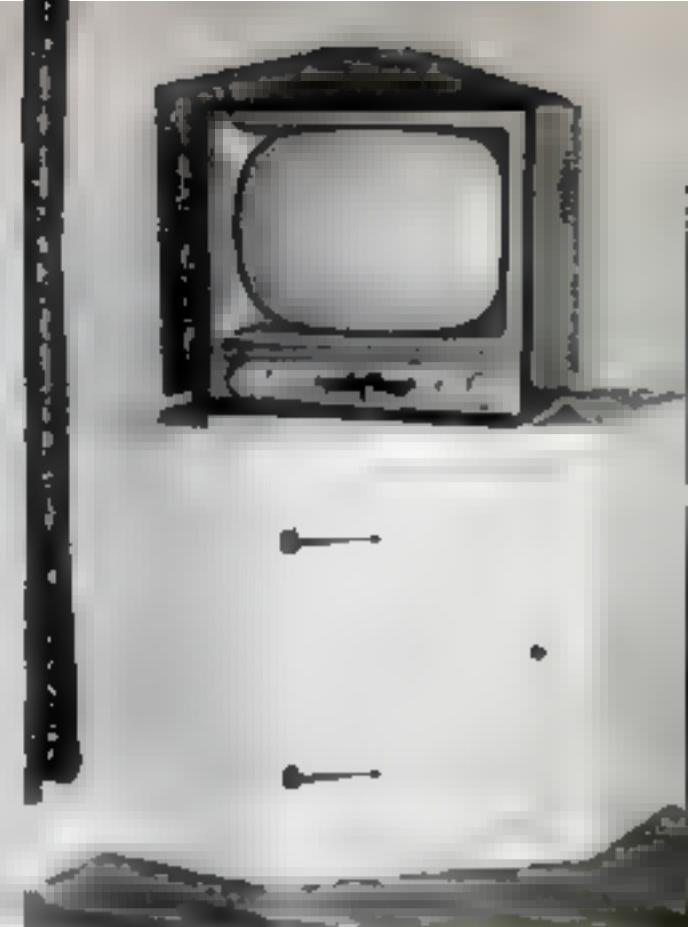
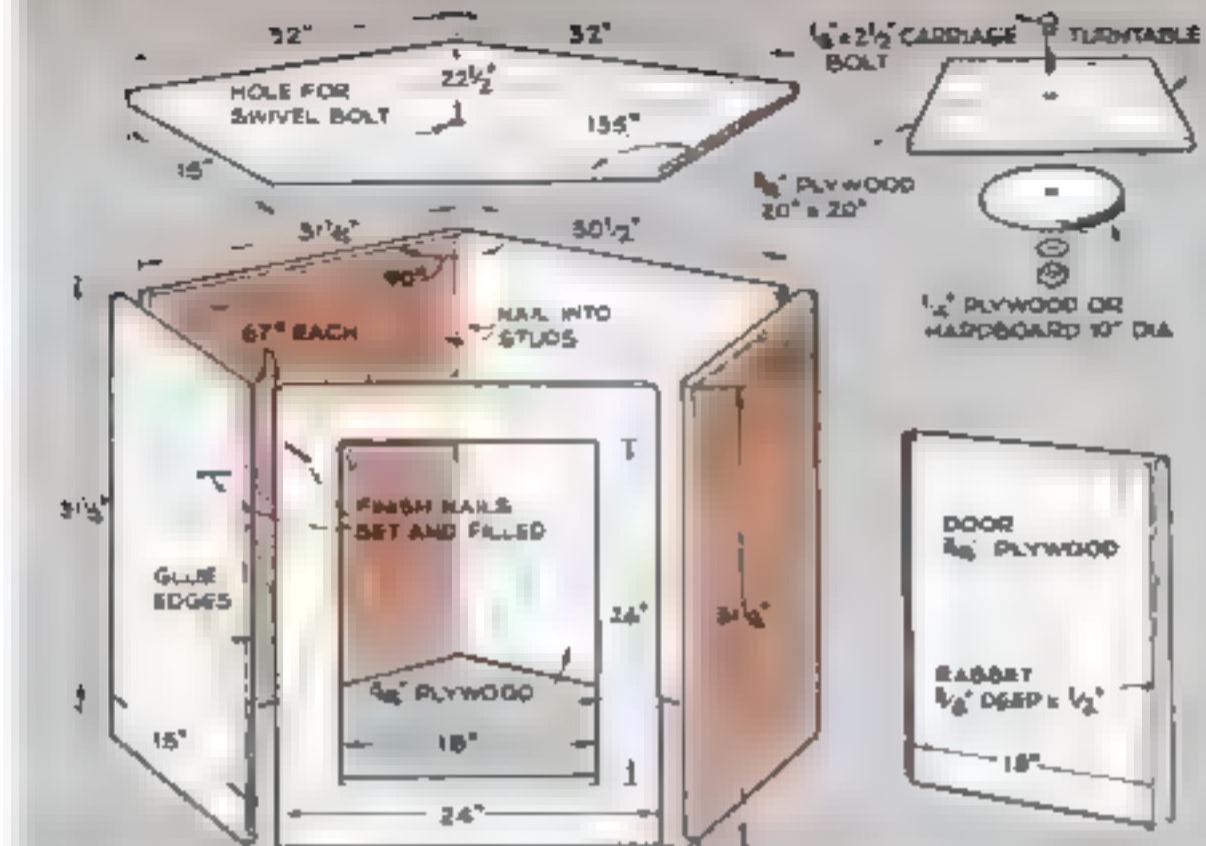
Here are three ways that you can make a table set stand on its own feet—literally by building a stand for it, or by concealing it in a wall cabinet.



1 This hinged tube, built into a separate plywood box, swings out for comfortable viewing from any part of the room. The rear of the tube and the deep cabinet for record albums extend into a closet behind the wall to save space.

The pivoted tube was devised by Don T. Thurow of Kalamazoo, Mich., to permit remote mounting of the chassis and controls. A standard tube-extension cord, available at radio stores, connects the tube to the chassis, which is built into a matching cabinet on the opposite side of the doorway.

A two-piece, piano-hinged folding door closes the upper half of the cabinet, eliminating a right-hand door that would interfere with traffic through the room doorway when the TV is in use. Fluted molding strips are tacked to the door faces to form a decorative design and to the plywood shelf edges.



2 A corner cabinet puts your set where it can be seen from the greatest number of angles and uses space that's often wasted. The added swivel lets you turn the set in any direction. You can use the lower part to store bulky appliances, such as a vacuum cleaner, or fit it with shelves.

The dimensions shown will take up to 21-inch sets, with plenty of clearance for swiveling. For larger sets, add 4" to the width of the two back pieces and 2"

all around to the turntable top. If you have a baseboard, cut the back pieces shorter by its height and rest them on top. Remove small moldings so that the pieces will sit flush on the floor.

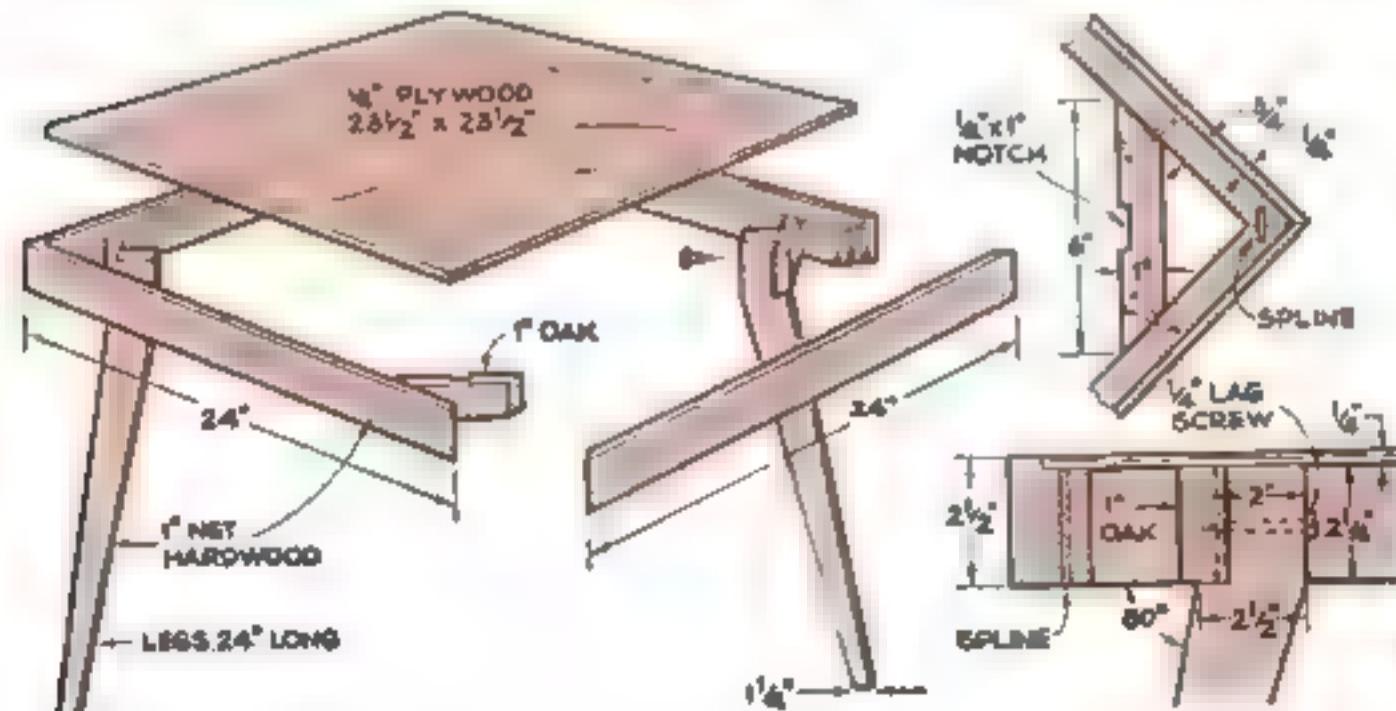
The turntable is a 20" square of $\frac{1}{4}$ " plywood that rotates on a large washer cut from thin plywood or hardboard. I mounted the door with black forged strap hinges and painted the cabinet with white enamel to match the woodwork.—V. H. Lamoy, Upper Jay, N. Y.

3 Here's a TV table that's easy to build, yet has the look of a fine piece of furniture. The side pieces and legs are made from 1" (actual thickness) hardwood. Use walnut or mahogany to match a dark cabinet, or birch for a blond one. Since you don't need much, you can get the beauty of good wood at little cost.

The frame is rabbeted to take a $\frac{1}{4}$ "-plywood top of matching veneer. Diagonals at the corners support the legs and

also the main weight of the set above. To join the splined corners, cut the miters first, then slot the ends $\frac{1}{4}$ " wide and deep to take $\frac{1}{4}$ "-by- $\frac{1}{8}$ " plywood splines.

The table shown is for a 21" set. For others, you can adjust the dimensions to suit, but keep the same height. For a decorative edge, cut a shallow saw kerf all around the assembled frame 1" below the top. Finish the wood with lacquer or shellac.—H. Sibley, Nuevo, Calif.

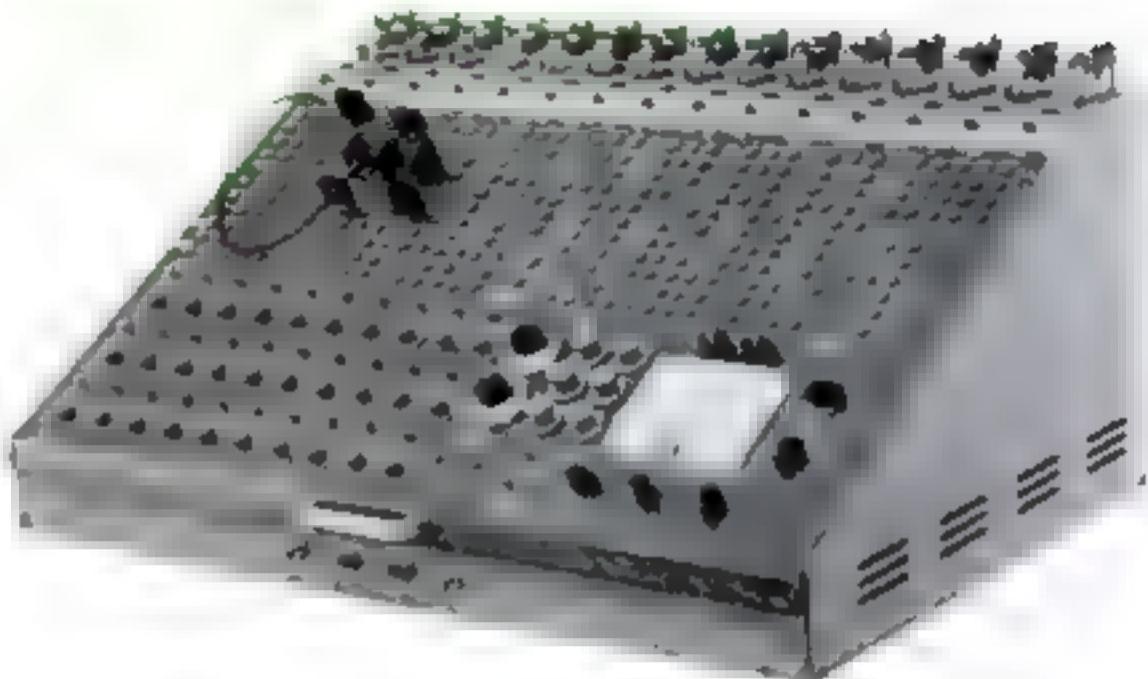


New in Electronics

1. Computer in Kit Form.

Now you can build even an electronic brain from a kit. For \$700 you get parts for this analog computer, a super slide rule that can solve real industrial and research problems, saving many hours of calculation or experiment.

It includes 30 coefficient potentiometers that can be set to better than 1/10 of 1 percent accuracy, a 13-tube drift-canceled power supply, a nulling meter for accurate voltage setting. A patch board shows the block layout that is set up.

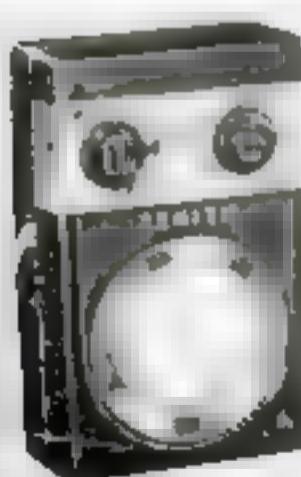


The cabinet houses 15 three-tube DC amplifiers. The meter can be switched to any of these, and set for full-scale deflection of plus or minus 2, 20 or 100 volts.

4. Rectifiers Go Tubular. New selenium rectifiers for high-voltage, low-current jobs (photo below) range from $\frac{1}{2}$ " to $\frac{1}{4}$ " in diameter. Rated at from 1 to 20 ma. per cell, they come with pigtails or fuse-clip ferrules. Power rectifiers in the familiar square shape (not shown) now have rounded corners to keep protective coatings well sealed and to provide added safety in handling.



2. Home Battery Portable. This six-transistor superhet (above) has a push-pull audio output stage and a 4" speaker. List-priced at \$60, the compact receiver is designed for room-to-room as well as outdoor use. Its single 9-volt battery is said by the maker to afford a full year's use, costing less than house current for operation.



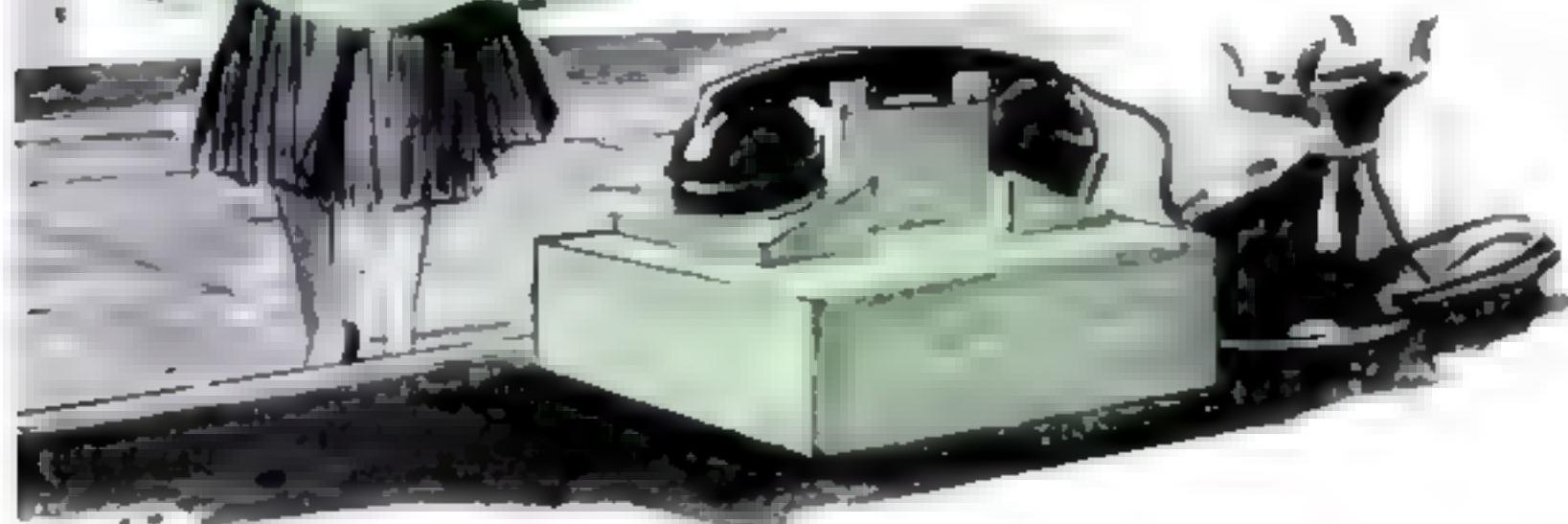
3. Midget Transistor Set. Packing a transistor circuit into its $3\frac{1}{2}$ "-by- $5\frac{1}{4}$ " nylon case, this midget is said to have 100 milliwatts of undistorted power output. Four pen cells power it. It's priced at \$75.

Further information on the products above can be obtained from: 1. Heath Company, Benton Harbor, Mich.; 2. DePold Radio Mfg. Corp., 35-15 37th Ave., Long Island City 1, N.Y.; 3. Zenith Radio Corp., 6001 West Dickens Ave., Chicago 39; 4. Cenco Switch & Signal, Pittsburgh 18, Pa.



How to Build a Hold-a-Phone

It listens while you're busy, calls when your party returns, even lets the family eavesdrop.



A LOUDSPEAKER SIGNALS when someone comes back on the wire. While waiting for this signal,

it is possible to take a cake out of the oven or handle other chores that are near at hand.

By Howard G. McEntee

NOBODY has to be chained to the telephone when asked to hold the line. This little transistor unit will patiently listen to that silent receiver—and sound off the moment the other party comes back on the line or a long-distance call comes through.

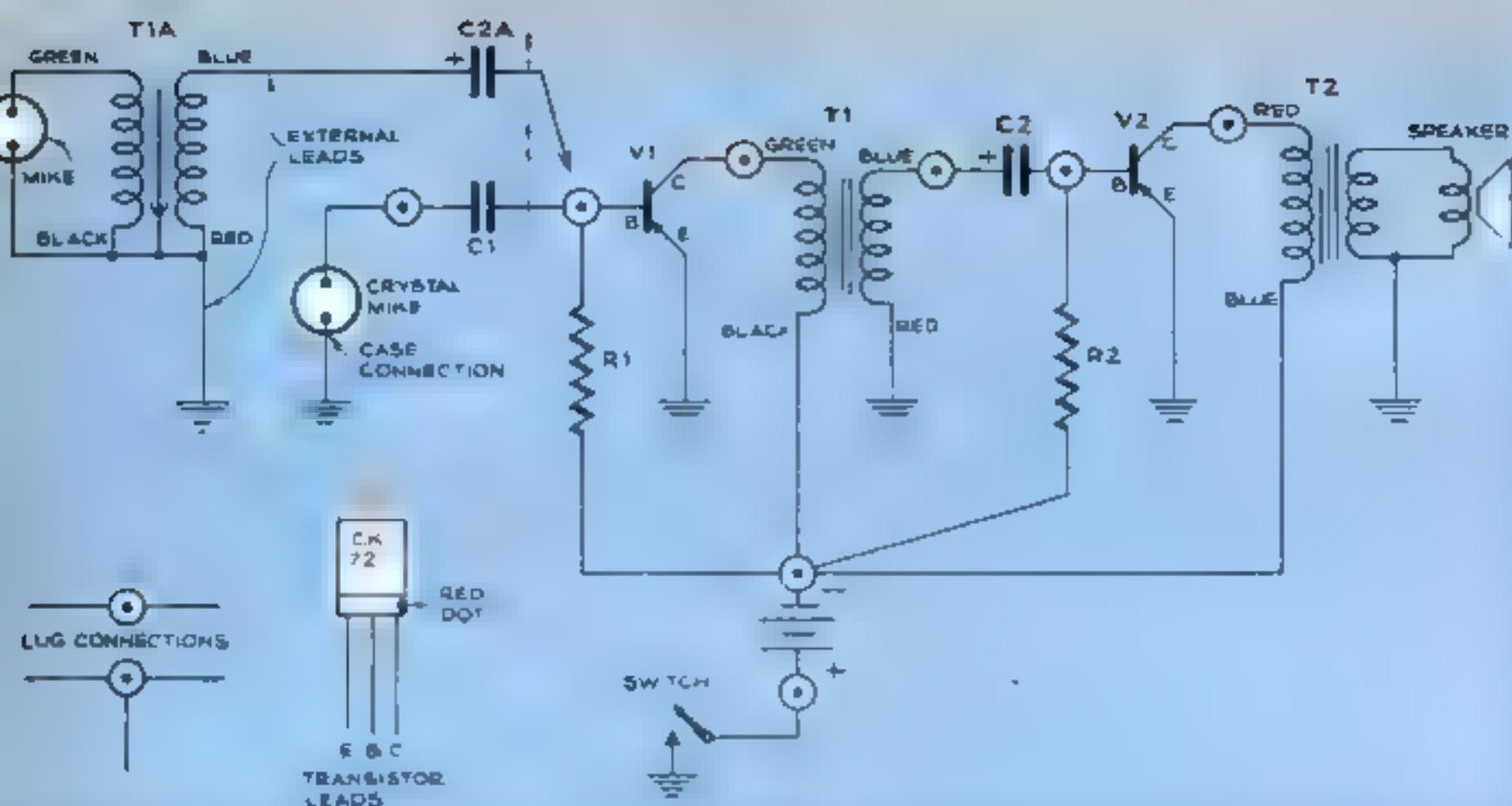
It will do more than that. Need both hands free to take down a long message?

Want the whole family to hear Grandma's holiday call from across the country? Place the handset on this rig, and everything in the receiver can be heard across the room.

With one extra transformer, the microphone can be placed a hundred feet or more away from the speaker. That makes it a one-way intercom or baby sitter. Any cry from the cradle will be relayed to the bridge table or even way down

DROP ON THE HANDSET, and this transistor rig will listen for and relay any sound in the receiver. As shown here, it is built for a left-hand user. If you usually hold the handset in the right hand, the speaker should be mounted on the other side.





IDENTIFY TRANSISTOR LEADS from the red mark at the collector end. Six of the ringed dots in

the diagram represent the strip lugs, the other two dots the battery-case or cell terminals.

CUT BLOCKS to suit your own phone. Bend the clips to an easy fit so that full weight of the instrument lies on the switch and rubber pads. Connect the mike with thin flexible wires.

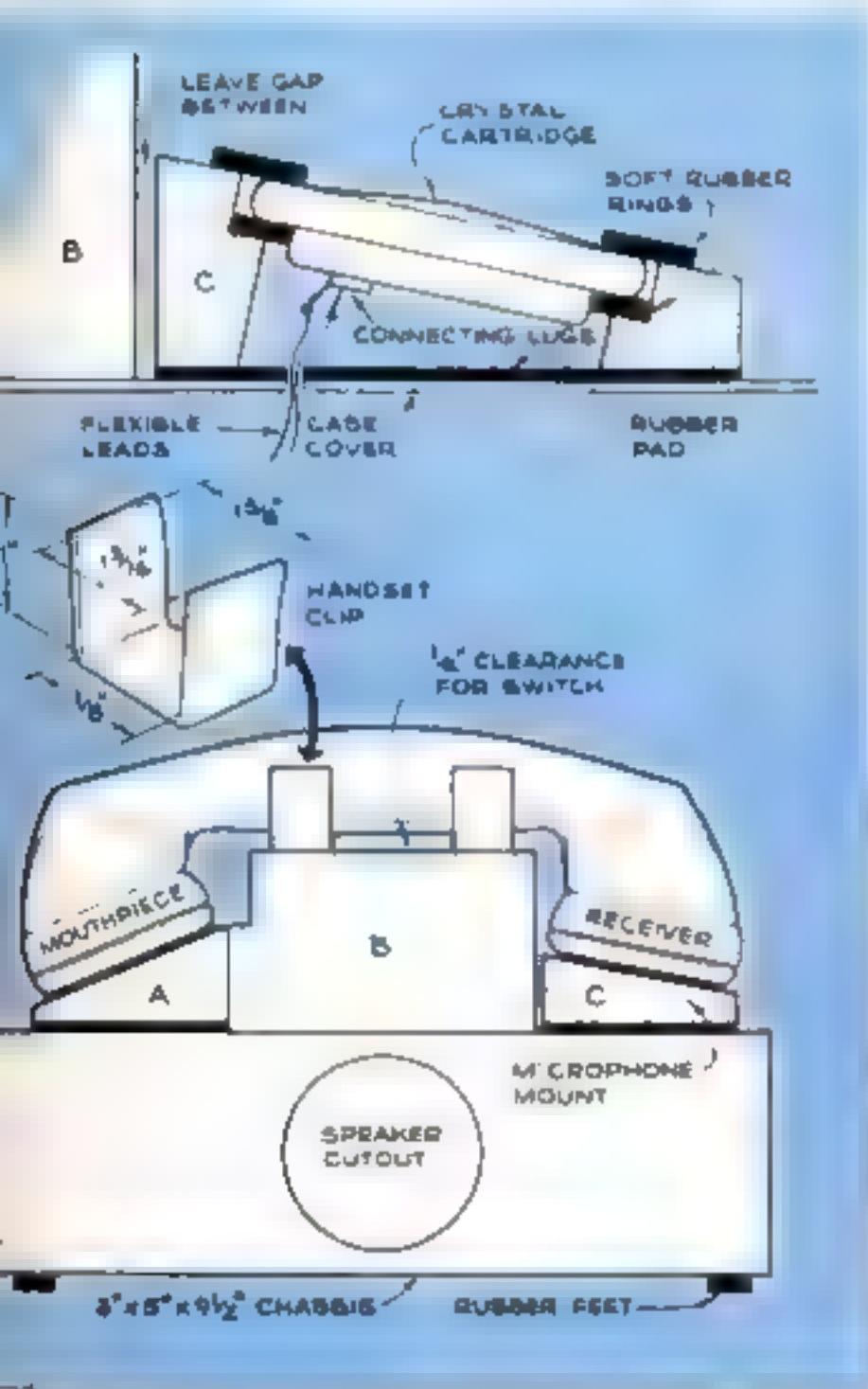
to your basement workshop, if you wish.

Batteries last and last. The rig is a two-transistor audio amplifier, with a microphone to pick up the sound from the telephone receiver, and a speaker to relay it at boosted volume. There is no power cord to plug in; the outfit is powered by four pen cells inside, and turns on automatically when the handset is set in place.

So low is the current drain that the dry cells would last hundreds of hours even with the switch left on. Therefore you can solder them right into the circuit if you like, saving the cost of a battery case.

Both mike and speaker can be inexpensive. If you are willing to experiment, cheaper transistors might be used, but it may then be necessary to experiment with different values for some parts. Be sure, too, to watch battery polarity. The CK721's specified are PNP's; with NPN's, the battery and electrolytic condenser would have to be reversed.

All parts, including the specified transistors, are available separately or can be bought as a kit.* Instead of the metal chassis shown, you can use a cigar box



*Parts available separately or in kit form from Federated Purchaser, Inc., 1021 Route 22, Mountainside, N.J.



CHASSIS LAYOUT is simple, and there is ample room for the extra mike-matching transformer

or homemade case. A suitable speaker might be salvaged from an old portable or table radio to reduce the cost.

Three wooden blocks, shaped from a two-by-four, support the hand rest on the switch and position its receiver over the microphone. Hold your own hand rest with the middle or grip section horizontal above a level surface, and cut cardboard wedges to fit under both ends. Use these wedges as patterns to cut the end blocks, which will probably be different in size and shape.

Rubber seals out noise. Sound leakage must be held down to prevent feedback. This is what happens if the mike picks up outside noise, sending it to be boosted by the amplifier. It will come out louder from the speaker, re-enter the mike, be amplified again and again, and wind up as a howl or whistle. Therefore blocks A and C must fit the handset closely, and block A should have a soft foam-rubber disk (cut from a rubber powder puff) cemented on top of it. Block C (under the receiver) has to be cut out to fit the amplifier mike.

This requires a round hole of two diameters, which form a step or rabbet in which the mike cartridge lies. Cut the top face of the block to the required angle, but make the hole before cutting

if desired. Battery holder can be dispensed with if leads are soldered directly to cells.

PARTS LIST

T1, T1A: Mike-to-grid transformer (Stancor A4705)
T2: Output transformer (Stancor A1329)
Microphone: Crystal mike replacement cartridge (Shure Model A7)
Speaker: 2" permanent-magnet type (Oxford 2AM51)
V1, V2: Raytheon CK721 transistors
C1: 01 mfd ceramic

C2, C2A: 5 mfd., 8 volt midget electrolytic
R1: 1 megohm carbon
R2: 75,000 ohm carbon
Misc: one 4-lug strip, 4 pen cells, battery holder (optional), chassis or box, metal for chassis bottom, guide clips and switch, sponge rubber, soft sheet and sponge rubber spagheti, hookup wire, etc.

the rest of the block to size or it may split. Set a circle cutter or expansion bit to the larger diameter, bore $\frac{1}{4}$ " deep with the bit at 90° to the sloping surface, reset to a smaller diameter, and continue through as in the drawing.

If you have no adjustable bit, jigsaw the hole somewhat larger than the outside of the cartridge, and glue a cardboard strip around inside to build up a rabbet.

Cement a ring of rubber into this, set in the cartridge, and glue a larger rubber ring outside to retain it and form a sealing cushion for the receiver.

Instead of screwing the mike block to the case, cement it on with a rubber pad between. Cut block B a trifle short so that it does not touch block C.

The switch. This is two strips of spring brass mounted on the center block with



SOUND-ABSORBING LINING inside the case helps reduce feedback. Fiber acoustic board or thick sponge rubber will serve. The kind

of cement used to hold auto weatherstripping will hold it to the case securely. The speaker is cemented to the lining, not fastened to the case.

wood screws so that the handset will press the upper one into contact with the lower. Shape the guide clips from strap iron or aluminum and line them with felt. Make certain that the switch is not stiff and that the clips do not pinch the handset, for as much of its weight as possible should lie on the rubber pads.

The entire case must be lined with sound-absorbent material. Pieces of a sponge-rubber kneeling pad will do. Attach them to the top and four sides of the interior with heavy-duty rubber cement.

Cut a hole in one side of the case for the speaker, and a matching hole in the lining for that side. Cement a disk of fine-mesh screen behind the hole in the case, attach the rubber lining, and cement the speaker to the rubber.

Wiring the amplifier. One six-lug strip serves for most of the connections and as transistor mounts, no sockets being used. Solder all else before attaching the transistors, which heat may damage. Leave their leads long, slip on tubing, and solder quickly with a hot iron.

Two lugs on the strip hold it to the base and serve for some of the ground

connections. Put a ground lug under one mounting screw of each transformer.

A howl may be heard if the contacts are closed by a finger, but it should stop when the handset covers the mike. If it continues, make sure that the seal fits the receiver, and that the speaker is not touching the case anywhere. If all else fails, the overall gain may be too high; lower it by increasing the resistance of R1.

How to boost sensitivity. The mike is badly mismatched to the first transistor. You can boost volume by coupling it through an extra transformer, preferably one like T1, though any 1:3 audio transformer

might be used. Break the circuit between C1 and R1, and connect the low-impedance winding through a second electrolytic condenser like C2 directly to R1.

This matches the mike to the transistor better, and is the setup needed for remote pickup. Mount the extra transformer right on the remote mike.

Feedback can be used to make the rig a code-practice outfit. Stand a book in front of the speaker, shifting it about until you get a clear note.

END

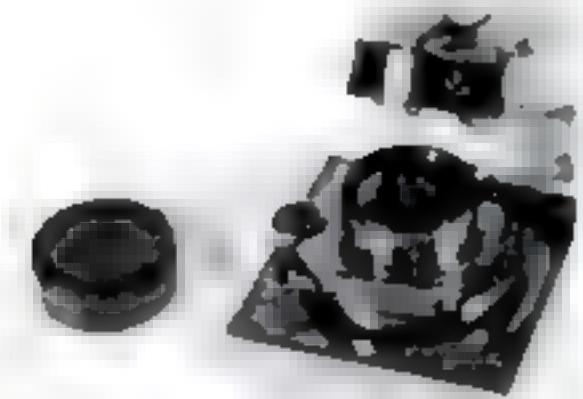
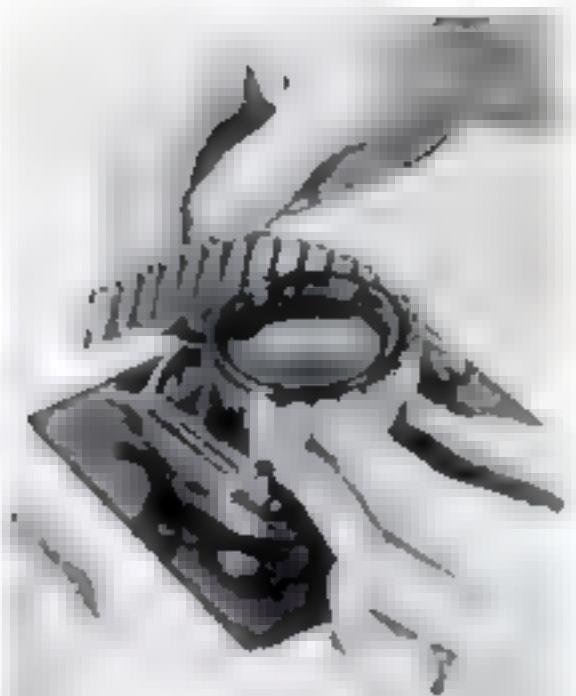
.....HINT TO AN UNHANDY HANDY MAN.....

Doing odd jobs

*With a twist of the wrist,
Is second nature
To the hobbyist.*

—HUGH LANEBACK

4 Photo Tips



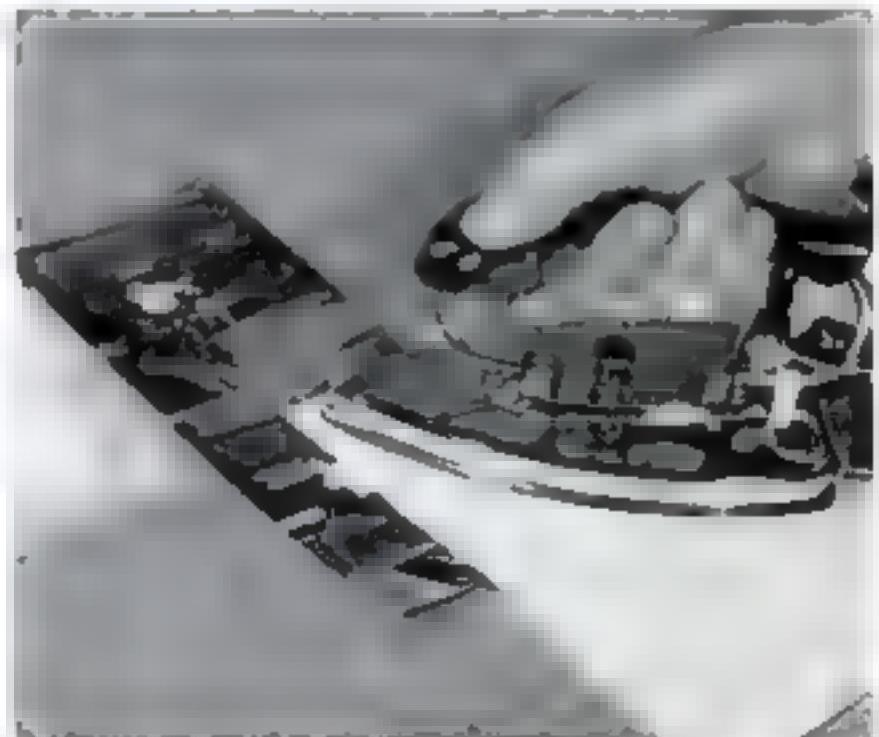
1 HOMEMADE LENS CAPS take only a few minutes to assemble this way. Tape a strip of corrugated cardboard around the lens barrel (upper photo). Then tape a plain cardboard disk on top, followed by a paper disk pasted on to hide the tape. Paint the cap black.



2 HARD-WATER SPECKS that settle on your subjects' noses can be eliminated by rinsing the negatives for a minute or two in a weak solution of acetic acid—half an ounce in a quart of water. The acid dissolves the lime in hard water that often dries on the film, producing a haze or spots on the negative.

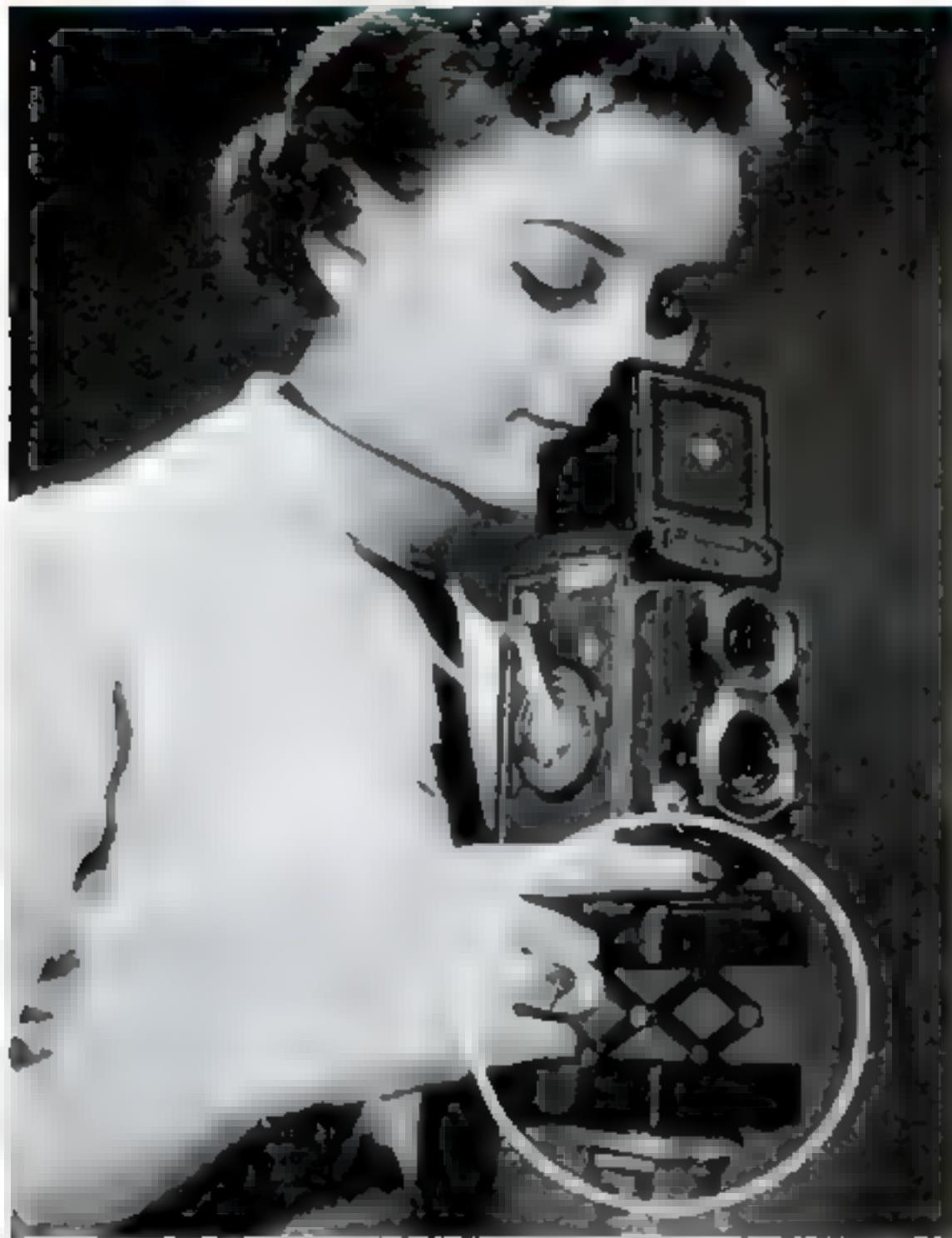


3 RESTORE LENS MARKINGS by brushing on thinned shellac and rubbing white chalk into the engraved depressions. Quickly wipe off the excess shellac and chalk. The crisp white outlines will remain glued in the grooves.



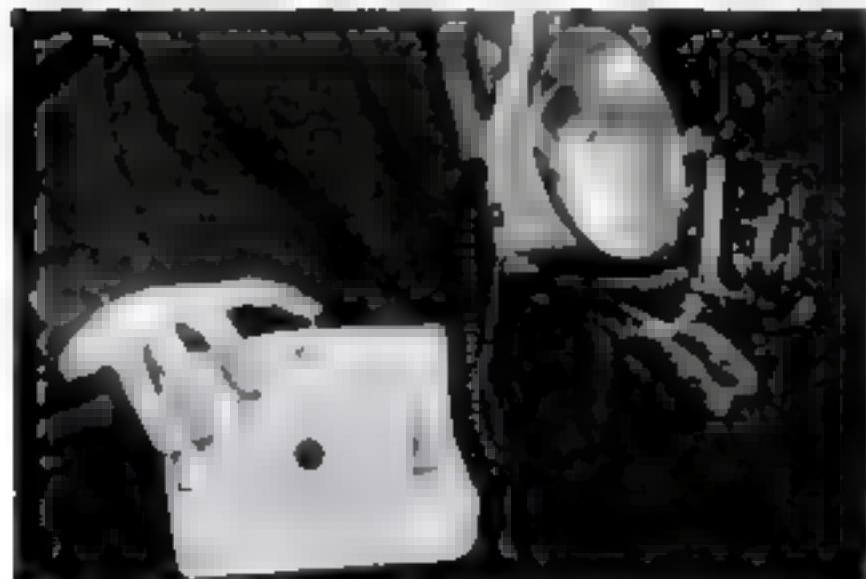
4 PHOTOGRAPHIC BLOTTERS are both useful and decorative for friends. Cut small blotters from large sheets, iron on the prints with mounting tissue, using a protective pad. Make your prints on matte paper, which won't crack.

New for Camera Fans



1. Accessory Adjusts for Parallax. This Japanese-made twin-lens automatic reflex camera has as a low-cost accessory an attachment that adjusts for parallax. It helps you shoot, at close up, the picture that you see on the ground glass. Called a Parajuster (circled in photo), it fits the bottom of the Minolta Autocord (and other reflexes having lenses 1½" apart between centers). You focus with the bed closed; then open it and the photographing lens is automatically raised to the former position of the picture viewing lens.

Priced in the U.S. at two-fifths the cost of most precision reflexes, the Minolta has a top speed of 1/400 sec., F/3.5 coated taking lens, and built-in flash and strobe synchronization.



2. Electronic Flash. Equipped with a permanent-type flash bulb and a power pack, a new flash outfit will also operate on 110-volt AC. Life of the bulb is estimated at more than 1,000 flashes; that of four flashlight D batteries in the pack at 200 to 300 flashes. Using house current wherever it is available saves the batteries for flash on outdoor shots.



3. Photos Printed on Metal. Sensitized aluminum sheets are available for ordinary darkroom printing of your favorite negatives. Prints made on them can be cemented to novelty ash trays, coasters, personal jewelry and other items.

Further information on these photographic products can be obtained from: I and J. FR Corp., 951 Brook Ave., NYC 51, J. Metalphoto Corp., 2943 E. 77 St., Cleveland 4.



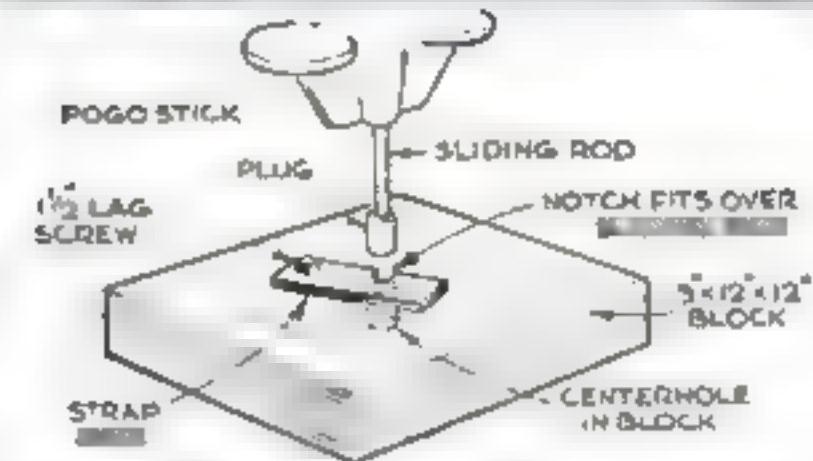
New Film Blows 'Em Big

NO ELEPHANT'S eye, this bigger-than-lifesize peeper is one of the pair that you see in the little picture at the upper left. The eye is a 30-times enlargement from the original 35-mm. negative, shown in actual size by the small photo. The picture was made with a new super-fine-grain film, an updated version of Kodak's Panatomic-X, now available in 35-mm. magazines and 828, 127, 120 and 620 rolls. The secret? Especially fine particles of silver in an extra-thin emulsion distribute light so evenly that details remain crisp, texture smooth.



Trainer for Young Babe Ruths

You can rig up a baseball batting tee for your youngster by slipping an 8" piece of rubber hose over one end of a 42" length of broomstick. Push the other end of the stick into the earth until the baseball rests on top at batting level.—*Lew Byrnes, Woodhaven, N. Y.*

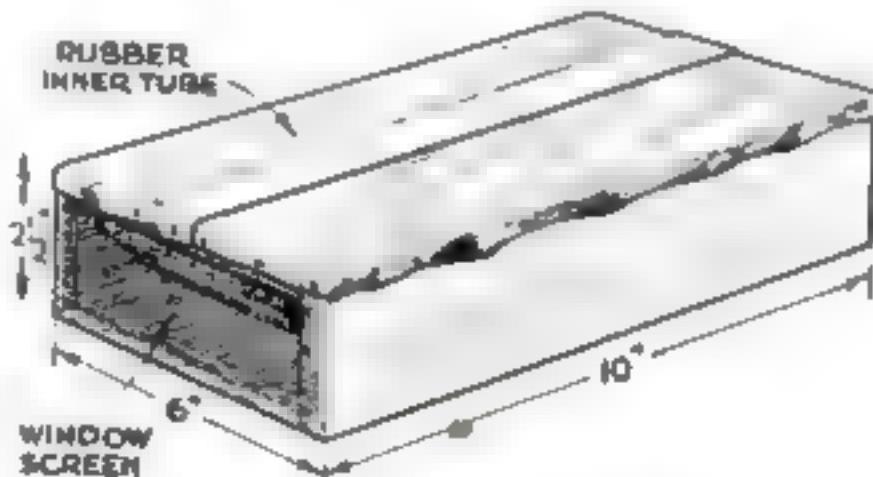


Pogo Stick Tamper Garden Soil

A pogo stick on a wood block will give you a spring-loaded tamper that's fun to use. Drill a 1" center hole in the block deep enough for the sliding-rod plug. Then notch a 4" length of strap iron and attach it over the hole with a single lag screw, so that it will swing over the rod and hold the plug. You can remove the stick when it's wanted for pogo.—*Scott J. Saunders, Plainview, N. Y.*

Cartons Protect Young Plants

A good way to keep young, tender plants free of insect pests is to cover them with milk cartons from which the bottoms have been cut off. You can open the caps on sunny days or for spraying, and close them on cold nights.



How to Make a Live-Bait Box

I MADE a 2 1/2"-by-6"-by-10" box for grasshoppers, crickets and similar live bait out of orange-crated stock, a scrap of window screen and a piece of inner tube. The 1/2"-thick crate ends (1/2" stock would also do) were used for the sides and bottom. I tacked screening to the ends and two overlapping strips of inner tube to the top. The bait is reached through the flexible overlap.—*Thomas P. Ramirez, Fond du Lac, Wis.*

We Make Our Own Glass Fishing Rods



By Phil McCafferty

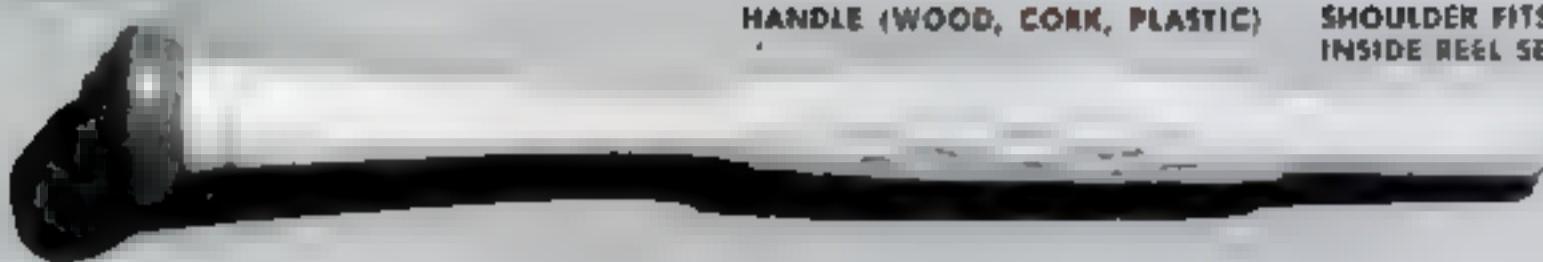
DID you know that it's possible to *make* one of those new glass fishing rods? I didn't either until my brother Bud and I priced them—and found that we could buy parts and assemble three big salt-water poles for the \$100 tag on a single one ready-made.

Those handsome salmon in the picture above are edible proof of what our homemade rods will do. That's Bud at the left, me at the right. We caught the salmon in Washington's Puget Sound.

You buy glass-rod blanks in the length and thickness needed for the type of rig that you want. Parts for salt-water rods like ours



RUBBER BUTT CAP



LINE GUIDES (PLACE FIRST ONE
18" FROM REEL, OTHERS ABOUT 12" APART)



METAL FERRULES (MOUNT
SOCKET END TOWARD REEL)



LINE GUIDE



PLUG FERRULE



SOCKET FERRULE

cost around \$30. For smaller bait-casting and other fresh-water rods you can get the whole works for as little as \$7.

It's fun, too. When you make your own rods, the only limit is your imagination. You can lathe-turn the handles to your own design or choose from scores of ready-made handles.

The handle is cemented into one end of a metal reel seat and the pole is ce-

mented into the other end. The only job that takes a little knack is winding on the line guides. The jig shown on page 216 holds the spool of thread, freeing your hands so that you can make neat professional-looking windings quickly.

Glass is tough. The spun-glass rods are so strong and springy that you can bend the thin ones double and they'll snap right out straight again. They can't

TO ATTACH HANDLE, this turned wood sleeve is shouldered to fit into the hollow metal reel seat. The pole is glued into the sleeve and sleeve into the seat with waterproof cement

USING HOLLOW-TYPE FERRULES makes it easy to get tight joints between sections. Slide ferrules on the pole until they jam, then back off ferrules and hacksaw the rod at those points





METAL REEL SEAT



ADJUSTABLE
LOCK NUT

CLIPS
HOLD REEL

SLEEVE FERRULE (FITS
INTO REEL SEAT)



SLEEVE (ADAPTS ROD DIAMETER
TO REEL-SEAT DIAMETER)

METAL
GRIP CHECK



GRIP CHECK

GLASS-ROD BLANK

PLUG FERRULE

GLASS-ROD BLANK

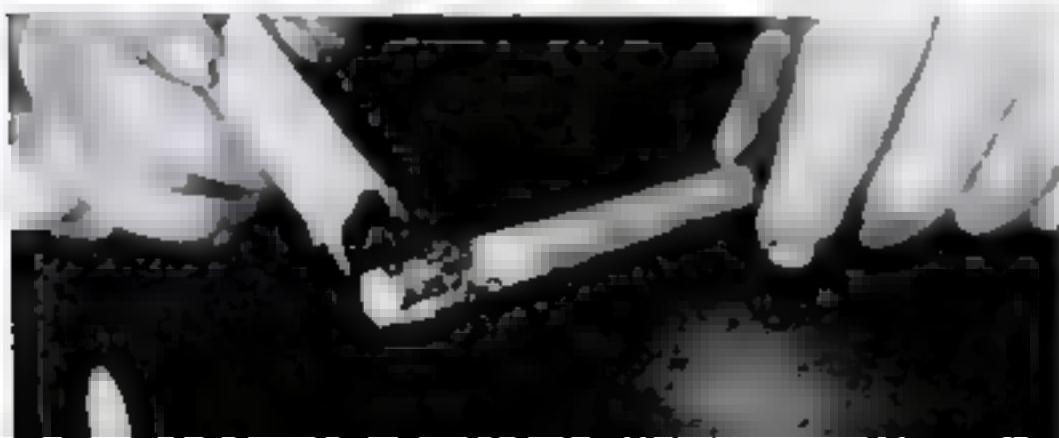
SMALLEST LINE GUIDE
(ABOUT 6" FROM TIP)

ROD TIP (TAPER ROD POINT
TO FIT SNUGLY INSIDE)

rot, rust or deteriorate. They're not affected by salt water or heat and cold.

How does glass get this way? It's something like the difference between a brittle steel rod and a tough, flexible cable. Fine spun-glass fibers that have a tensile strength greater than steel piano wire are woven into cloth, and the cloth is wrapped in layers around a slim, tapered mandrel. A plastic bonding resin impreg-

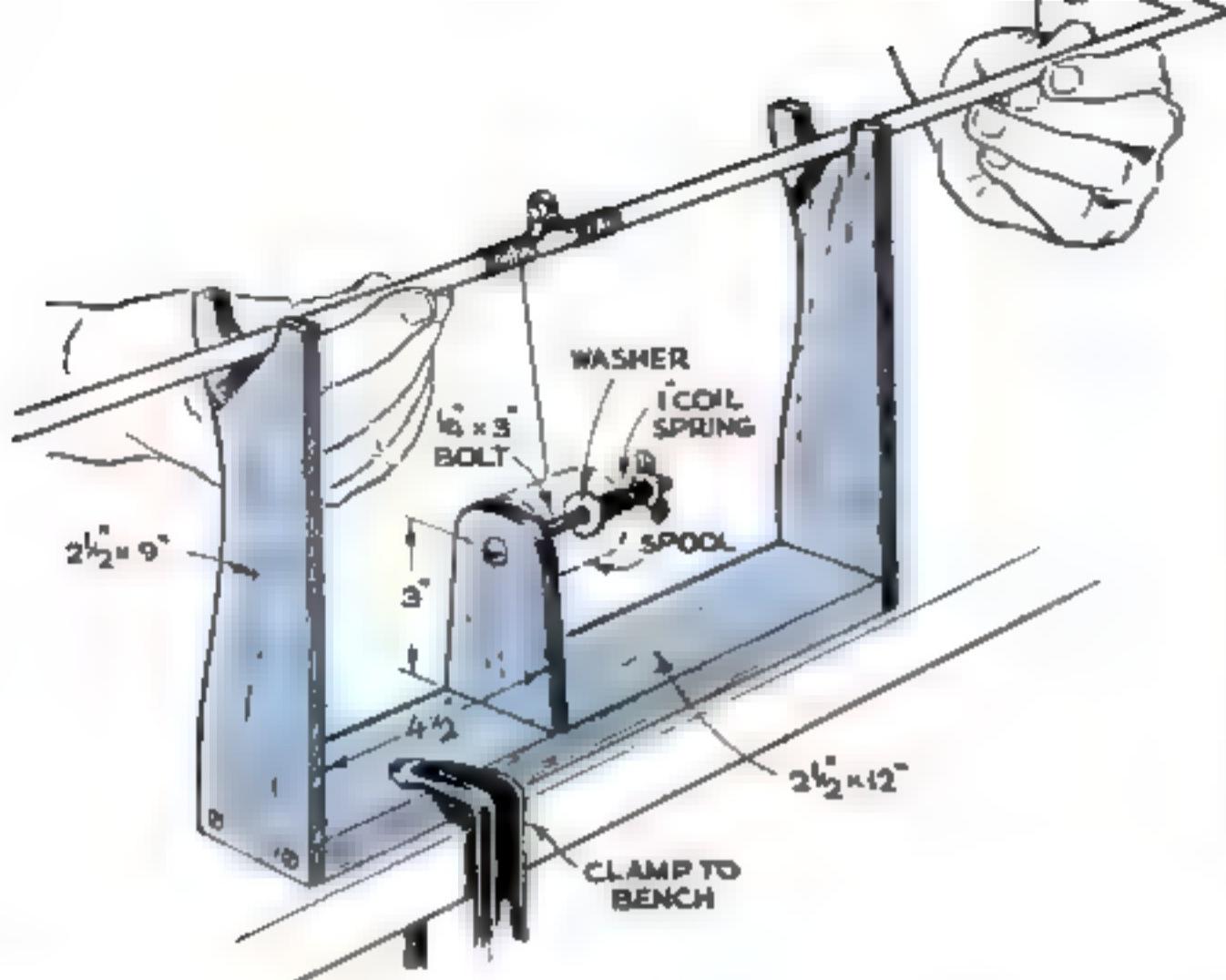
STICK CEMENT, heated over a candle, is used to glue on the ferrules. You have to work fast—the cement hardens quickly. The rod can be shaped slightly with a file or sandpaper.



LAYOUT OF PARTS shows a typical glass rod, divided into sections for easy portability. Rod here does not represent actual dimensions, but shows how the fittings are arranged. Cut the sections first so that the line guides can be staggered to miss the joints. Biggest guide, near reel, should equal rod's diameter at its thickest point. Succeeding guides become smaller toward the tip and are closer together. Space them from about 12" down to 6" apart.



YOU CAN MAKE OR BUY a variety of handles like these to suit any type of rod. If you get one that has a collet chuck (at top), be sure that the rod will fit the chuck opening.

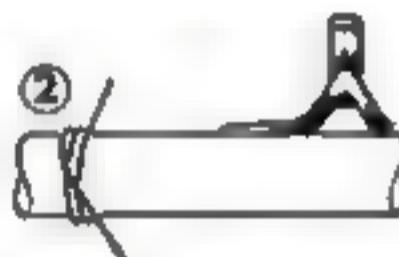


JIG BUILT OF SCRAP makes a quick, neat job of winding on the thread that holds the line guides in place. By adjusting the spring tension on the spool, you can keep the thread taut while rotating the rod in the cradle. To start a winding, tape on one leg of the guide to hold it in place temporarily, then follow the steps shown in the sketches (below left).

How to wind a tieless binding



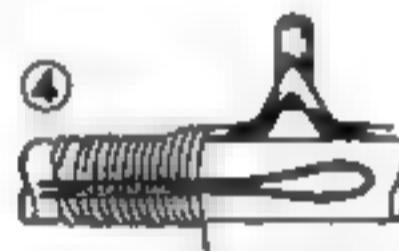
Wind two full turns on rod, starting about $\frac{1}{8}$ " from guides.



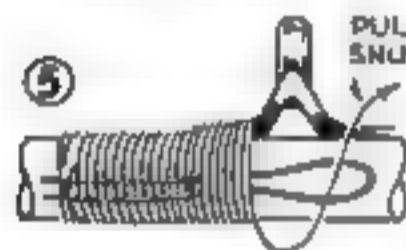
Cross long end over first two turns.



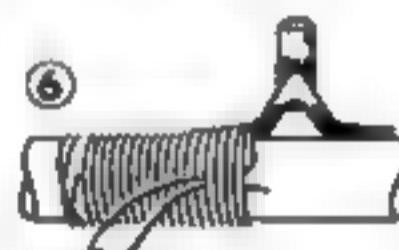
Wind on about 8 turns, clip off free end, and continue winding. Keep turns taut and close together.



Near end of winding (about 8 turns), slip separate loop of thread under line and keep on winding over it.



When leg on guide is fully covered, cut off thread and pull end through loop.



PULL. Pull loop out, drawing thread with it, then slip thread off close to winding with next blade.

If you shop at a local store, the salesman will help you select the right parts. If you order by mail, tell them what kind of rod you want and they will make up a set of hardware to fit.

In addition to the handle, you'll need a set of ferrules. These are plug-and-socket connectors that are cemented onto the cut ends of the rod sections so that you can fit them together or take them apart easily. Rods from 6' to 8' long are usually divided into two sections; over 8', three sections. As a general rule, the fewer the sections you can use, the stronger the rod will be.

You'll also need a set of line guides, about one to each foot of rod. When you lay out the guides, space them slightly closer as they progress toward the tip.

Assembling the rod. Mount the handle first to find the rod's overall length before cutting it into sections. The ferrules may not fit snugly at points that will make the sections come out exactly equal in length, but a difference of several inches doesn't matter. It's better to have tight-fitting ferrules than precisely even lengths. You can whittle the rod down a bit to fit a ferrule, but never try to shim it up—the ferrule will work loose.

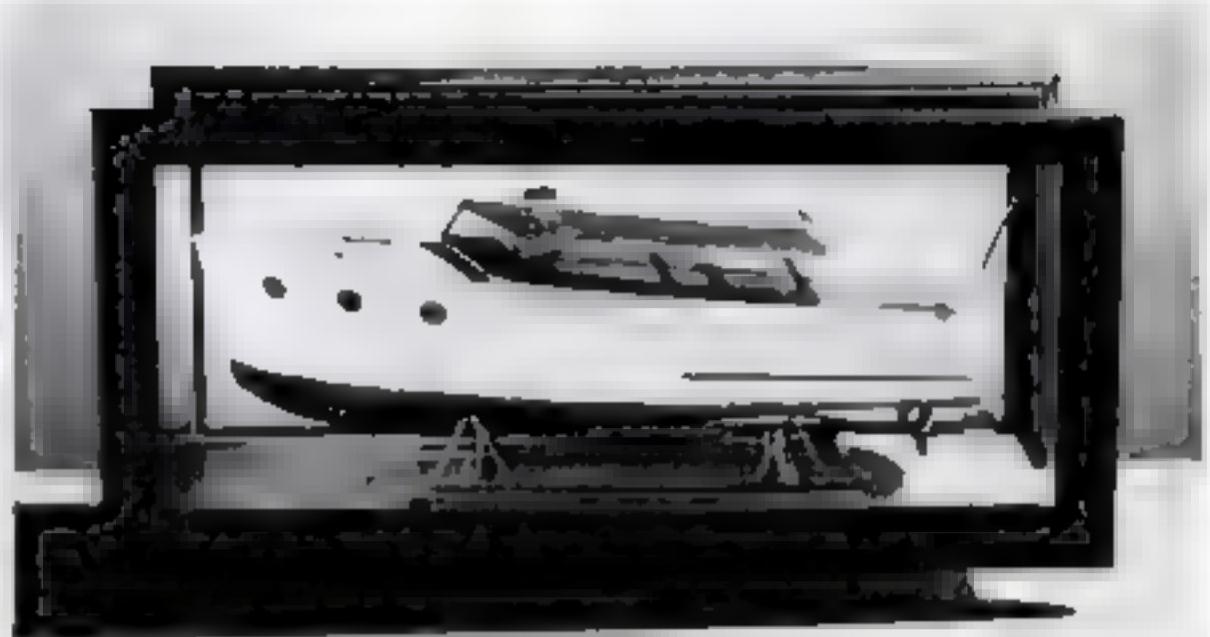
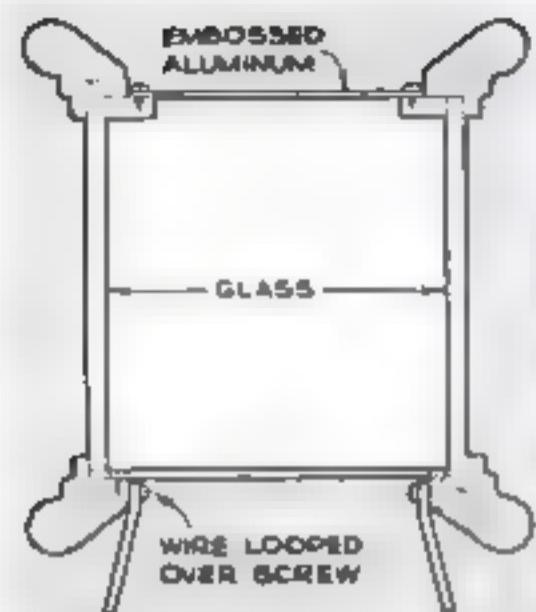
To bind on the line guides, special nylon winding thread is available in many colors. Use size A for slim light fly rods, E for medium-sized rods, and heavy EE for the big salt-water rigs.

END

nating the cloth supplies the resiliency.

Buying the parts. Many sporting-goods stores stock a full range of rod blanks and supplies. Rod hardware is available by mail from Montgomery Ward. You can also order supplies from the places where we bought ours.*

*The Yakima Hardware Co., 116 E. Yakima Ave., Yakima, Wash.; and Hester's, Inc., Waconia, Minn.



Picture Frames Make Attractive Case for Model Display

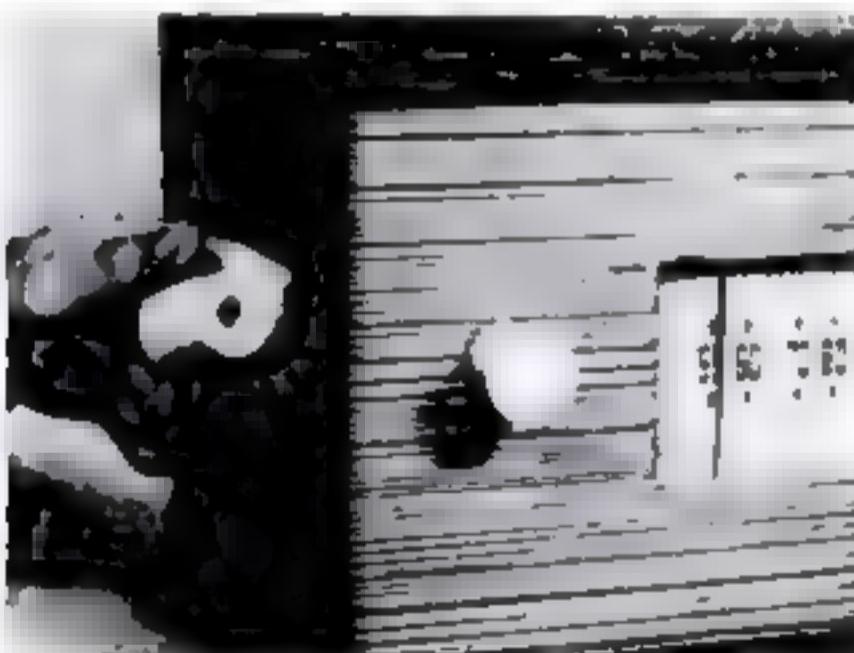
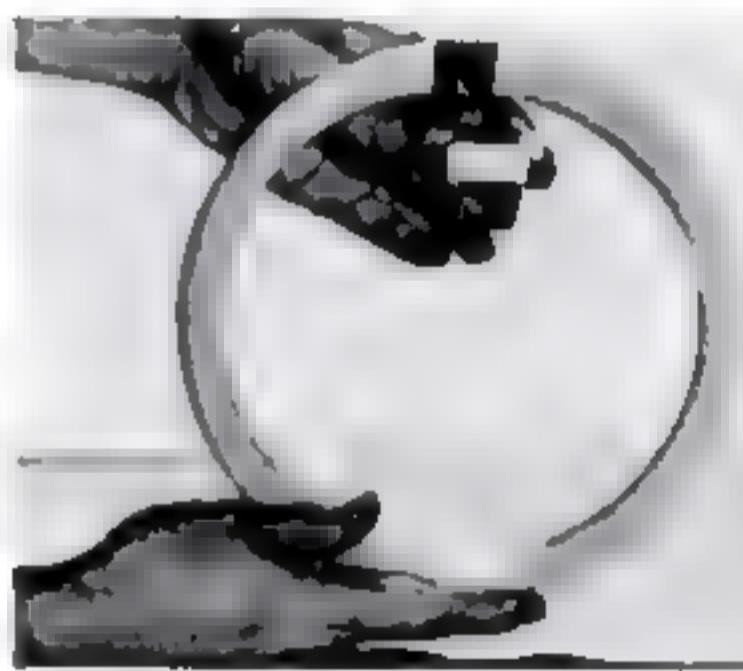
To MAKE a display case for a model, I used two picture frames, four sheets of embossed aluminum, two pieces of glass, and legs bent from stiff wire.

Three aluminum sheets were screwed to the bottom and side rabbets; then the

glass was held in place in the top rabbets with plastic cement. The aluminum lid was screwed to two projecting strips of wood also cemented in place, as shown in the drawing. I painted both frames a flat black.—*Gus Hall, Brooklyn, N.Y.*

Ring-Toss Game Is Made from Rubber Hose and Bits of Dowel

CHILDREN will be entertained with a set of quoits you can make from rubber hose and doweling. Cut the hose into lengths for rings, and join the ends with short dowel pieces glued and taped in place. The target peg can be a longer dowel stuck into a drilled board.



Bottle Caps Form Radio Knobs

RADIO control knobs can be made from the ornamental caps on cosmetic bottles. Pack wood filler into the caps and force them on the control shafts, which should first be lightly greased to prevent sticking. For round shafts, drill a hole in the side of each cap to take a setscrew.

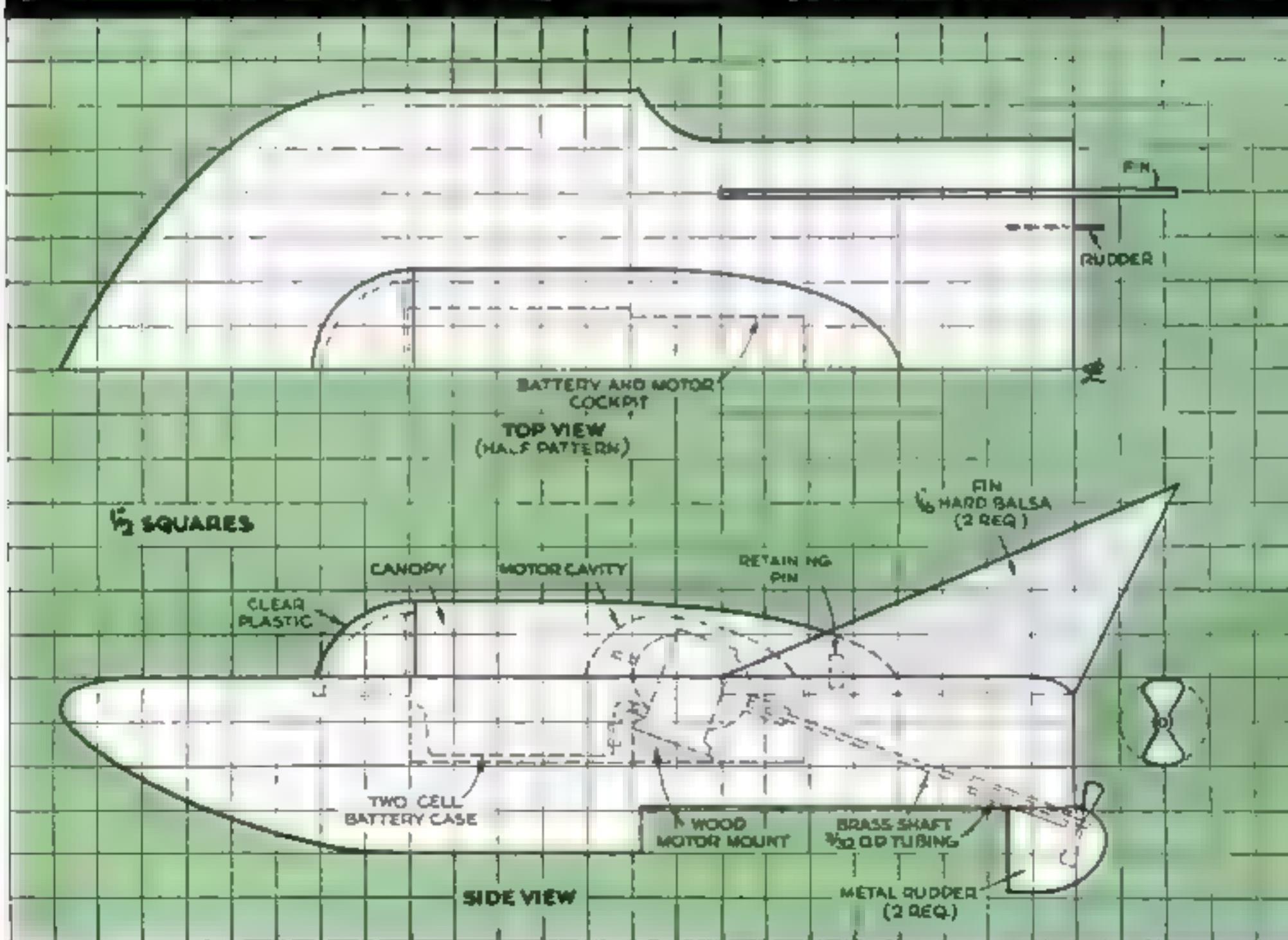
Burlap Prevents Seed Washout

A PIECE of burlap set over newly planted seeds will keep them from being washed around by watering. Cut the burlap to the shape of the box or pot, as below. Use it until plants appear.



Here's a new and exciting trick for hobbyists—

Shaping Power Models from Foam Plastic





By Louis Boury

BUILD just one model from foam plastic, and you'll wonder why somebody didn't think of this long ago. The stuff is a natural for boats and planes. A 1'-by-3' piece weighs only half a pound. More buoyant than cork, it never gets waterlogged. The worst that impact can do is dent it, and dents can be filled.

Best of all, it makes for fast work. Rigid foam plastic requires no fussily fitted bulkheads or stringers. Just carve and sand it to shape.

You can buy foam plastic from dealers in window-display materials. It's also sold by novelty and dime stores.

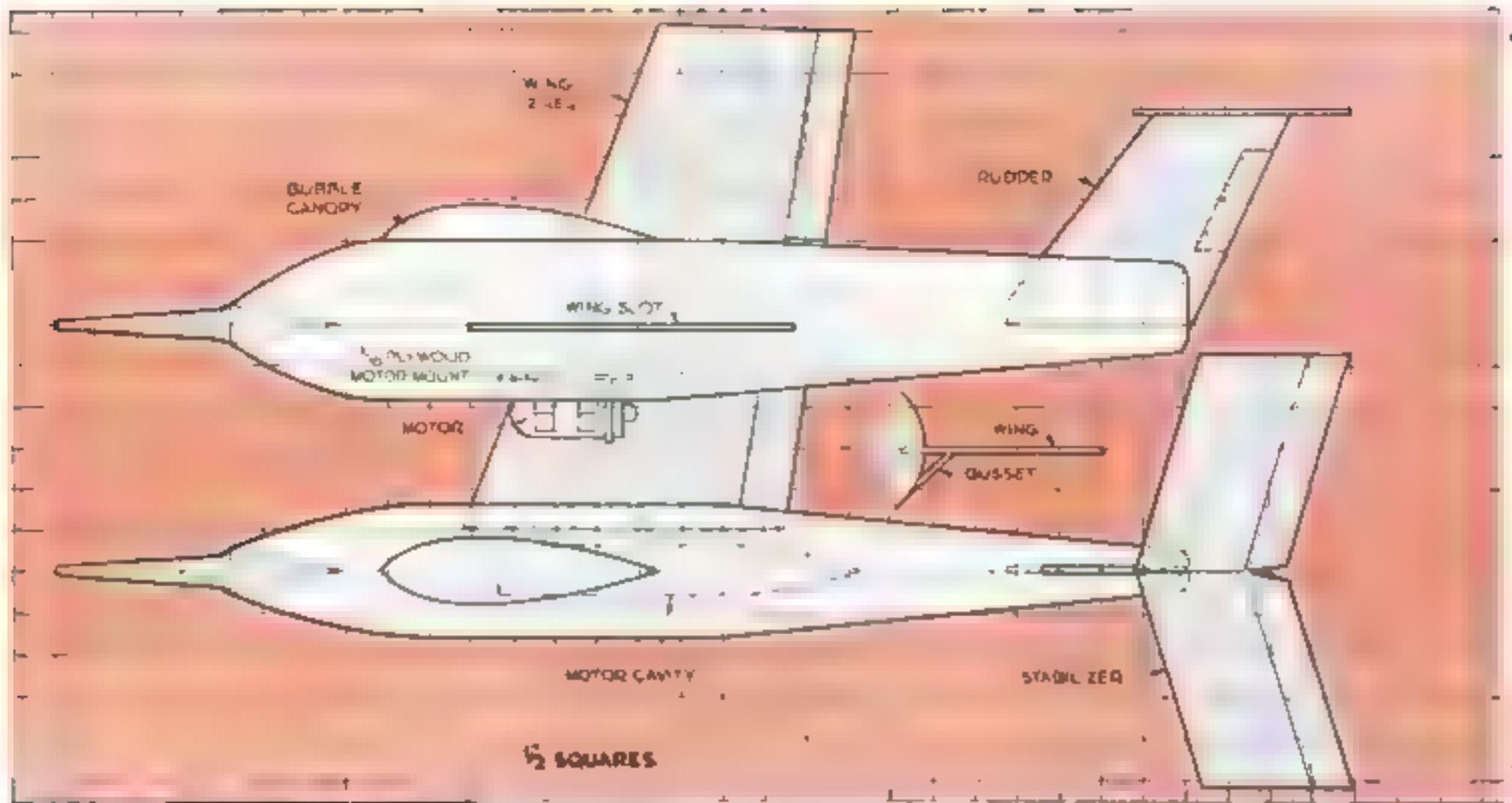
Whittle with sandpaper. A sharp knife will do for rough cutting. Use coarse sandpaper to shape, medium and fine sandpaper to smooth the material. To join parts, use one of the white resin-emulsion glues (never model-airplane or cellulose cements, which dissolve the plastic).

Electric speedboat. Draw a grid of 1" squares on cardboard, mark where the pattern lines cross, and cut out side and top profiles. Glue together two 1"-thick sheets of foam plastic and draw the centerline on one face. Mark out the top from the half pattern by flipping it over on both sides of this line. Cut to the side profile first, and then to the top outline. Make grooves for the balsa fins with a broken hacksaw blade.

Mount the motor on a wooden wedge. Glue this into the cockpit hollowed out of the hull. Push the brass shaft bearing in at an angle as in the drawing, connecting motor and prop shafts with a bit of neoprene tubing. Cut the propeller from thin aluminum or tin-can stock, punch the hole a tight fit on similar tubing, and press this on the shaft.

Shape the canopy with a step to catch under the plastic windshield. Glue in a bit of dowel at the back to drop into a hole in the hull and hold the canopy in.

A real jet plane. Draw side and top fuselage profiles on a 2"-square bar of



GLUE WING HALVES into slots in fuselage. Brace each with a long gusset glued beneath wing root at a 45° angle (arrows). The motor clips in as shown in this underside view.

foam plastic, marking the wing and rudder slots. Saw these in the bar before cutting the fuselage to shape.

Cut wing and stabilizer parts from medium-hard balsa. Score on the dotted lines for easy bending to make flight adjustments. Coat with clear dope.

Carve the needle nose from hard balsa and glue on a purchased canopy. Attach the jet-motor clip to 1/16" plywood with screws. Glue the plywood in as shown.

Check with a square to get the stabilizer surfaces at exactly 90° to the rudder, and sight along the fuselage to align them parallel with the wing.



TO MAKE WINDSHIELD, place heat-softened plastic over a glass and push a lamp bulb into it. Cut resulting dome in half. No switch is used. Inserting second cell starts the motor.



CUT HULL SQUARE at sides, but round it off forward below the step. Press metal rudders in with a bit of glue. Double-coat bottom with vinyl-resin glue; finish with spar varnish. END



The Four Ways to Remove Paint

By Darrell Huff

TAKING off old paint, varnish or lacquer is a sure-fire route to greater respect for the people who make the stuff. They're making finishes tougher and more lasting every day.

Fortunately, the folks who think up better ways to remove finishes are on the job, too. New gadgets and developments are taking the fight out of old paint.

What's new? Rotary cutters that ac-

tually plane off old paint; electric paint peelers that take the heat off the heat-removing method (pyromaniacs can keep on using blowtorches); open-coat abrasives that don't simply transfer a coat of paint from wall to paper—the particles drop off; new paste removers that cling to paint that's not on the level; liquids that come packaged in pressure-spray containers—you just press the button!

The experts say that the secret of



SPRAY-ON REMOVERS are easy to apply. As with liquid and paste removers, the softened paint must then be scraped off the wood.



WATER WASHES AWAY PAINT when you use a new type of chemical remover. The water raises the wood grain, but light sanding smooths it.

easy removal lies in selecting the right method, and in using it in the right way. In general you have four methods of paint removal to choose from:

Heat: burn it off.

Rotary cutting: plane it off.

Abrasives: sand it off.

Chemical removers: dissolve it off.

We'll take these methods up one at a time.

Burning off paint. Let's start with the blowtorch method, getting in and out fast on that one. You move the torch slowly along the siding (blowtorches are for exterior use only) and follow it with a putty knife held in the other hand. The blowtorch treatment works. It has been used for a long time. But many a man has started out to remove house paint with a blowtorch and wound up removing the house.

To cook off paint without the hazards of a blowtorch, use an electric paint peeler. It's a plug-in device containing a heating element and one or two scrapers. It usually costs between \$10 and \$15.

A peeler should be moved slowly over the surface. The heating element softens the paint, and a built-in scraper peels it off. Some models have a front scraper in addition, for places that the back scraper

won't reach. Or you can use a putty knife. At least one variety includes odd-shaped auxiliary scrapers for molded shapes.

You can use peelers for outside or inside work. They work best on paint, not so well on varnish. And their action is a bit too drastic for jobs on furniture.

Cutting off paint. At close to \$250 you are not likely to buy a rotary paint scraper for a single job, but you may be able to rent one and save yourself a good deal of time and mess.

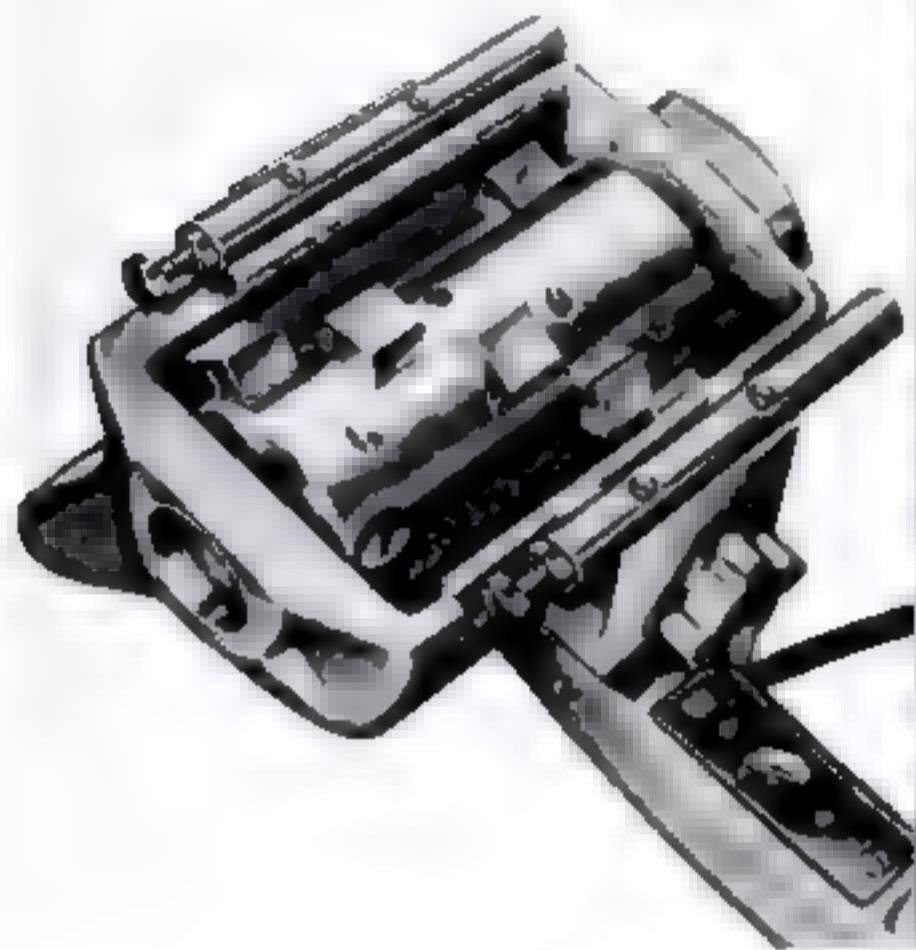
The Roto-Paint Scraper,* is a flexible-shaft tool. The motor hangs on your hip and you hold a special kind of electric plane in your hand. It cuts just deep enough to take off paint. Since the rotary scraper is intended mainly for clapboard, it is shaped to take paint off the underside as well as the face; but it works on flat surfaces—railings, table tops, floors—as well.

The manufacturer figures that you can cover 100 square feet an hour, making the scraper three or four times faster than the torch or chemical methods.

Sanding off paint. With modern

*The Roto-Paint Scraper is made by the Stow Mfg. Co., 382 Sheet St., Binghamton, N.Y. Makers of wash-day removers include Creative Chemical Co. (RPG), 2737 E. Nine Mile Rd., Hazel Park, Mich., and Winfield Brooks Co. (TM 4), Henshaw St., Woburn, Mass.

FASTEAST MECHANICAL WAY of removing paint is this rotary cutter. It planes off the coatings of paint, leaving the wood clean and smooth. The tool is expensive but can sometimes be rented.



abrasives you can cut down almost anything, but sanding is still a slow way to remove heavy coats of paint or varnish. The best bet on furniture work is to use a chemical remover first, then sand it.

If you want to take off much finish by abrasion, use an open-coat paper—the kind with space between the grains—so that it will not load up too rapidly. You can get such papers for disk sanders and for those that take abrasive sheets, but not for belt sanders. Aluminum oxide paper works best.

Chemical removers. The biggest news in unpainting with chemicals is the development of wash-away removers.* They are quite different from the water-flush types that have been around for a long time but limited to industrial work and to metal surfaces.

Wash-off removers may be of paste consistency or they may be thin liquids—either flammable or nonflammable.

You apply the new removers with a brush, flowing them on thickly. After

five to 30 minutes, the paint will be so softened that it will rinse away—or will form a water emulsion when mopped with a soaping rag.

You may have to do some scraping, but ordinarily not. As with conventional removers, you may have to put on a second coat of remover if the piece you're working on has several layers of ancient and petrified paint.

The wash-off ones are more expensive than more familiar removers—but may go enough farther to even things up. As they are used with water, they may raise the grain on wood. Light sanding will take care of this. Advantages: They are almost ideally quick and clean for taking paint off metal; they produce less goo and mess, and they permit cleaning the brush in water.

Just as conventional removers vary from brand to brand and type to type in the matter of just which finishes they work best on, so do wash-away removers. One rinse-off type, for instance, is not

very useful in taking off rubber-based swimming pool enamel, while another tackles it as well as the best of the usual types.

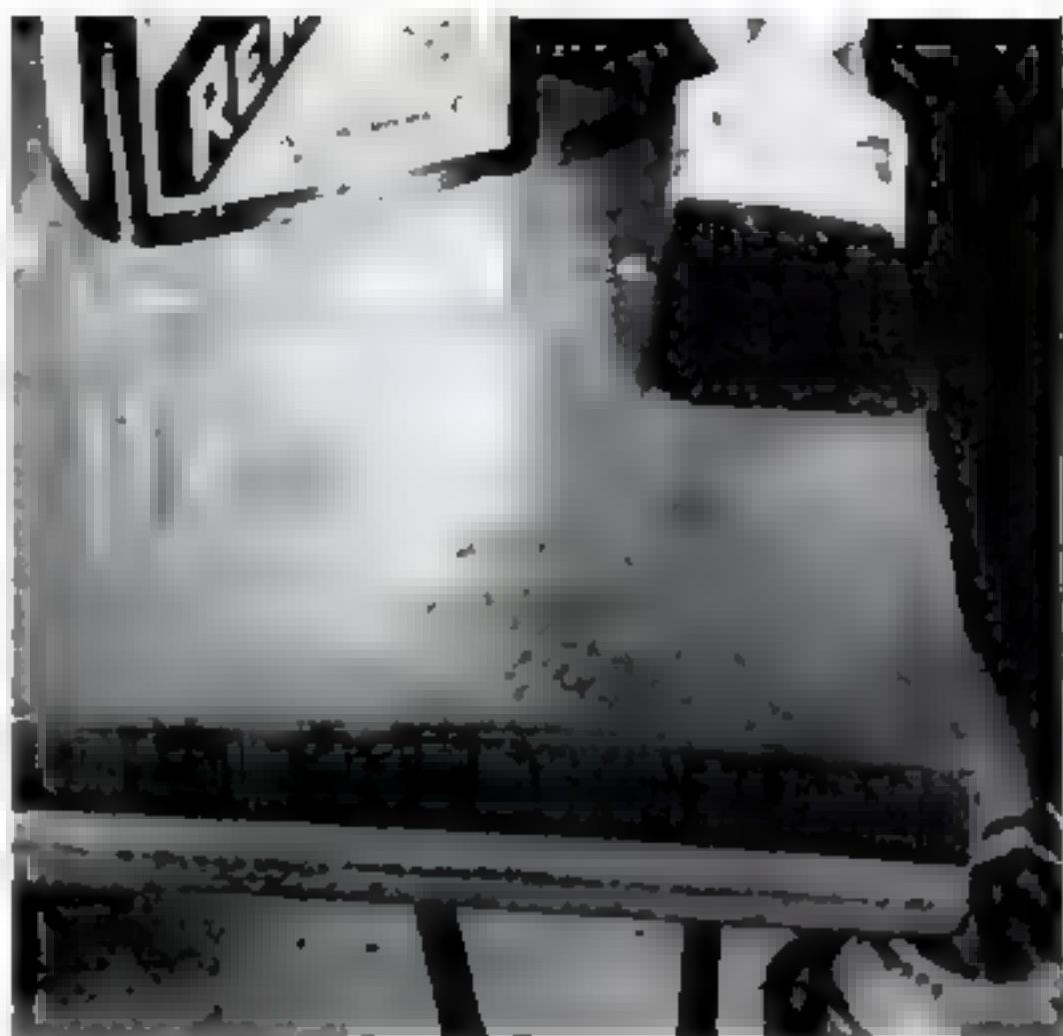
Most paint removers leave stained wood untouched while lifting the varnish neatly off it. This is true also of at least one rinse-off formulation (*R.P.O.*), while another leading brand (*TM-4*) removes stain as well as varnish (and paint, enamel, lacquer, shellac, resin emulsion, water paint, rubber-base paints, and synthetic finishes).

Spray removers. Pressure-pack removers are highly efficient, clean and handy—but rather expensive. These spray cans are easily suitable for fine furniture work and other small jobs.

The spray remover produces a slushy, snowlike deposit that discourages rundown and avoids a thinly liquid mess that would be hard to take off. As a result, this form of remover often does as thorough a job in one application as a liquid type can do in two, neatly balancing the fact that it is likely to cost about twice as much per ounce.

Liquid removers. There are three basic types. Each has disadvantages.

The low-priced removers are inefficient and fairly dangerous to use. They are generally effective only for removal



YOU BRUSH ON both liquid and paste removers. Put the remover on thick and don't brush out or go back over the job. Give the remover

of thin varnish coats on horizontal surfaces. Even then, this may require several applications and fairly messy scraping. A thorough washing of the surface afterwards is essential, since this type contains wax that would interfere with refinishing. The only economy in a cheap (benzol) remover is in purchase price.

Flammable removers of the non-ben-

Boiling Shutters in a Chemical Solution Removes the Paint



OLD paint came off two dozen pairs of window shutters with surprising ease when I boiled them in a solution of a common household cleaner (Oakite). To do the job, I first had a sheet-metal

shop make up a galvanized-iron pan 4" deep, 20" wide and 72" long—a little larger than the standard shutter. Then I dug a shallow trench in the back yard and piled the dirt up at the sides, topped the dirt with bricks to support the pan, and set a piece of drainpipe at one end to act as a chimney.

After filling the pan two-thirds full of water, I dumped in three large packages of the cleaner and built a large wood fire under the pan.

When each shutter had been boiled about 10 minutes, the paint was so loose that it could be washed off by turning on the garden hose full force.—Stanley W. Gilbert, Middletown, Conn.



plenty of time and it will do most of the work. Rush it—and you will do the work. Blisters (as in the shot above) are a sign that the paint is

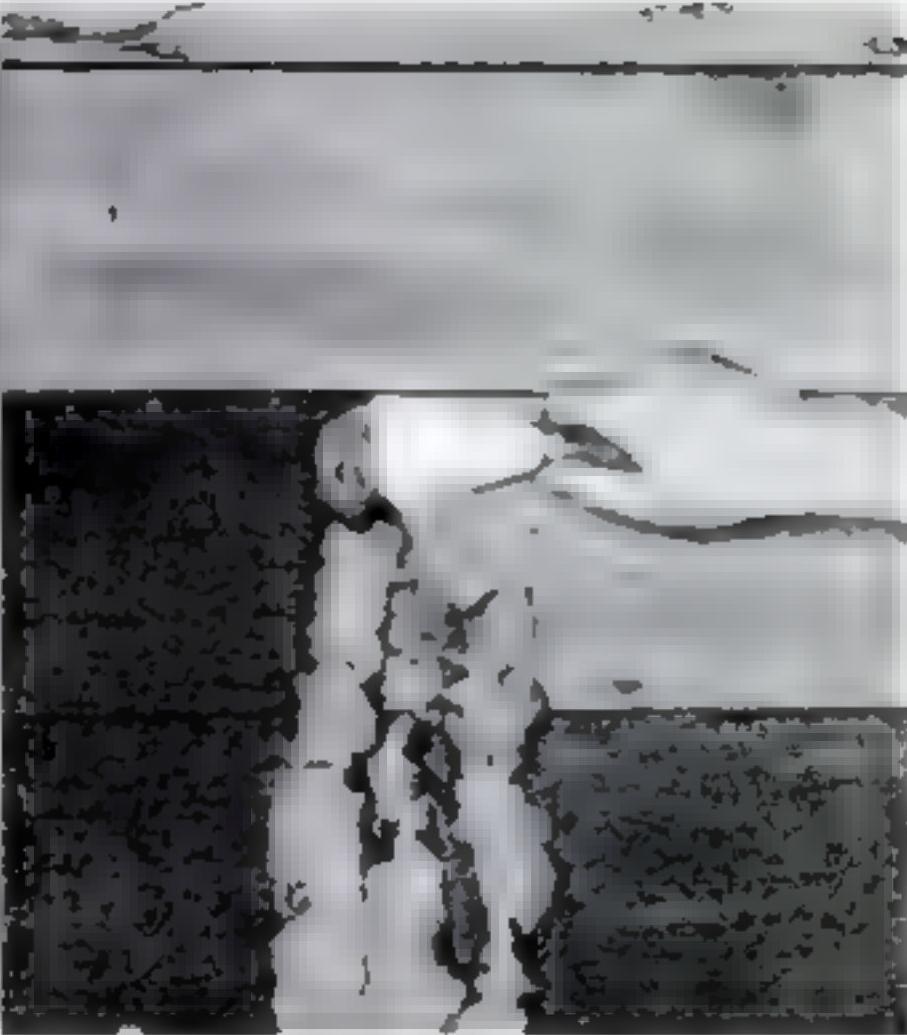
zol type are not explosive and offer no great hazard of fire. They are much less toxic than other types and are harmless to hands and clothing. On most finishes their penetrating action is so great that they will lift an almost unlimited number of coats.

Non-flammable paint removers, the third type, are usually hard on the hands, dangerous to breathe, and somewhat less effective in penetrating than flammable varieties. They are the obvious choice where a fire hazard exists. They also are the most effective kind in removing baked enamel and some synthetic finishes. Some varieties require an after-wash with solvent, some do not.

Paste removers. A good thing about paste removers is that they cling rather than run. This is important on vertical surfaces, of course, but a virtue on others as well.

Thick-bodied removers can do big stripping jobs such as the outside of a house. You can get a pretty good idea of how to do such a job and how long it will take from a recent test that was expertly handled and carefully timed.

Two men started at the top of one side of a big two-story house at eight in



ready for easy removal by scraping. When the right remover is used correctly, even old house paint should come off easily as at right.

the morning, brushing on the remover. They reached bottom in 45 minutes, then did the whole job over again right away, from top to bottom. Then they started to scrape. At 4:30 the putty-knife work was finished and the whole area had been wiped down with rags soaked in paint thinner. It worked out to 270 square feet per man per day.

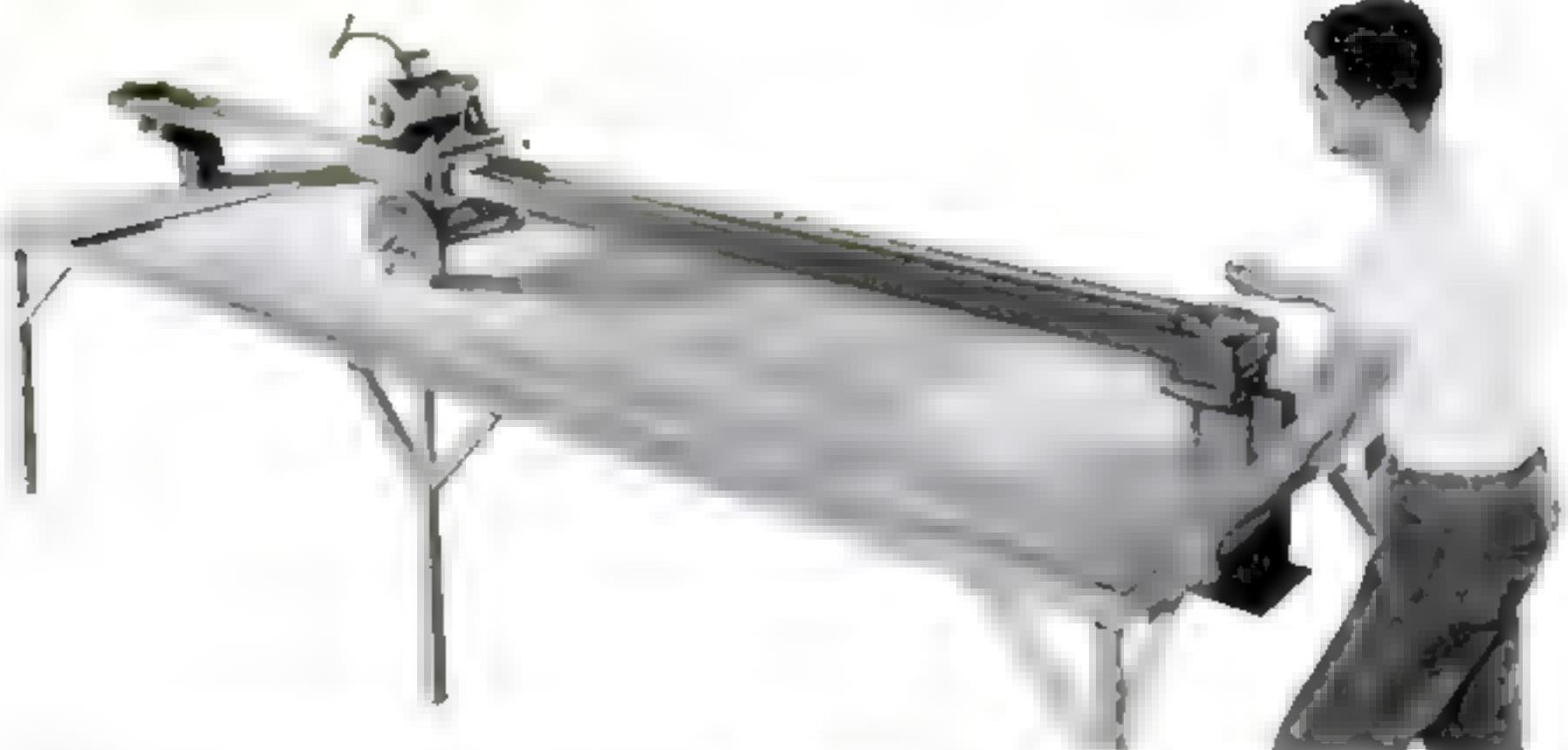
How to apply removers. In using a pressure-pack remover, hold it eight to 15 inches from the surface. Try not to be either stingy or over-generous in spraying work for an ample coat but don't load the surface. Let it stand for several minutes, then test with a putty knife. If the finish doesn't come off down to bare wood, let it stand longer. Finally strip it off with a putty knife. Then wipe with steel wool or a rough rag.

Apply a liquid or paste remover with a paintbrush. Use a brush in good working order, not a worn-out stub. Flow it on thickly, using the flat of the brush. Don't brush it out like paint; this breaks the protective film that forms on the top of the remover to retard evaporation.

If you have trouble spreading a remover of a liquid type you may want to

[Continued on page 272]

New Tools



1. Saw on Rails Cuts Long Panels. With this 10" circular saw on rails, you can cut large sheets of plywood, plastic, metal or other materials in one pass. A

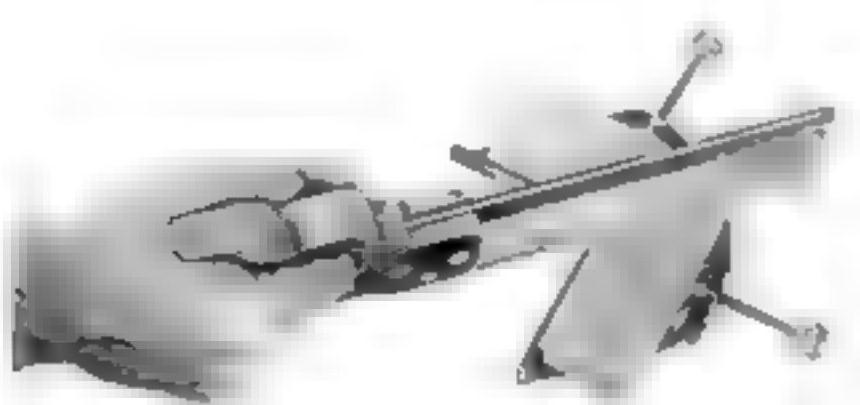
wheel at one end controls a cable that moves the saw up and back on steel rails. The unit can be tilted to make 45° cuts. The rails come in lengths of 4' to 9'.



2. Clamp Holds Odd Shapes. This flexible webbing can be used to clamp glued-up square, circular or odd-shaped pieces. Turning a spring-release ratchet tightens the strap at any desired point.



3. Knurled Bits Lock in Chuck. Special $\frac{1}{4}$ " knurled shanks make it easy for you to clamp even a cheap chuck firmly on these drill bits. They are available in sets of various size combinations.



4. Corner Clamp Corrects Miters. If a mitered joint doesn't fit, you can lock the pieces together in this clamp and run a saw through to true the cuts. Two thumb screws hold work up to 2" wide.

Further information on the tools shown on this page can be obtained from: I-De-II Corp., Constantine, Mich.; E. Angle Products, Box 814, Meriden, Conn.; E. Hansen Mfg. Co., Worcester, Mass.; & Garter Mfg. Co., 234 Hartford Rd., Manchester, Conn.



How to Adjust Your Brakes

As the linings wear, they must be pulled closer to the shoes. This is an easy hour-or-so job.

By E. F. Lindsley

DOES your brake pedal go down almost to the mat before your car comes to a stop? Do you have to pump the pedal to build up a comfortable pedal clearance? If your car is fairly new or the linings are new, the chances are that a minor adjustment job will clear up the trouble. This is an easy job that you can do in an hour or so some Saturday morning.

The master cylinder for a hydraulic-brake system is a simple plunger pump. For a given amount of pedal travel you

pump a specific amount of fluid to each of the four wheels. If the wheel cylinders must push the brake shoes a good distance to contact the drum, the pedal must travel farther to force sufficient fluid down there. The idea is to adjust the shoes so that they barely clear the drums and need only a slight nudge to jolt them out into contact.

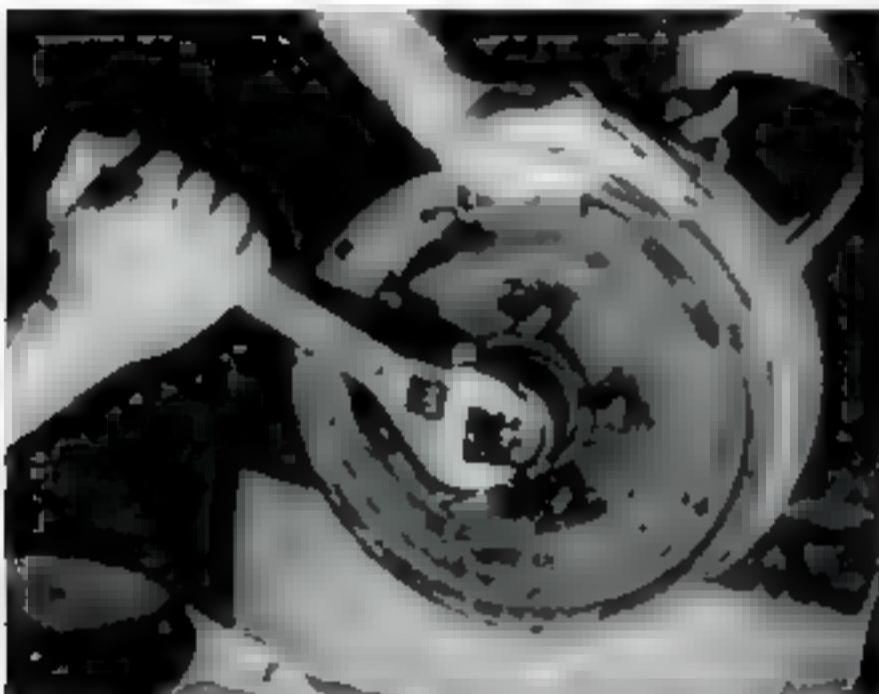
This is the big difference between a minor and major brake adjustment. A major adjustment sets up basic relationships of the brake anchor pins to give certain design clearances between the brake-shoe heel and toe, and between front and rear shoes and the brake drum. Once this is established by an expert, at the factory or in a good brake shop, even an amateur can make routine minor ad-

justments during the life of the linings.

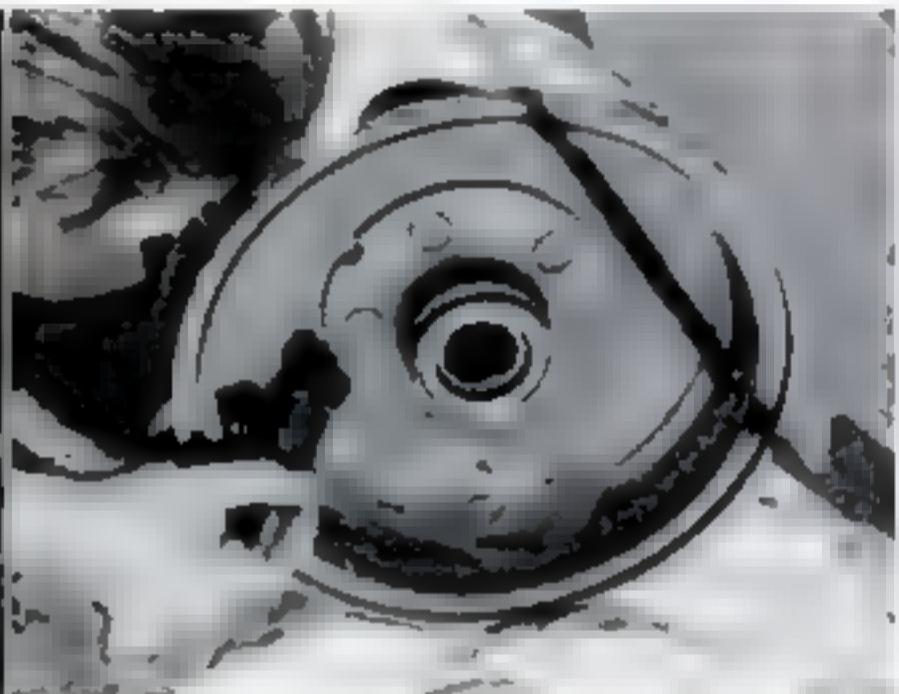
The star-wheel adjustment system is one of the three main types of adjusting mechanisms. This type is easily spotted by the small elongated dust cover of rubber or metal that covers the wheel. Pry off this cover and you find a notched wheel an inch or so in diameter (you may need a light to see it). This wheel may be at top or bottom of the back-plate. Some brakes have two wheels.

Ordinarily a screwdriver thrust into the notches and levered against the side of the slot will turn the wheel. Bending a slight dogleg in the screwdriver will sometimes make it easier. You might also try a beverage-can opener with the end ground square.

A pair of eccentrics or cams are provided for adjustment in some other cars. The business ends project from the back-plate. They are easily attacked after



PULLING THE WHEEL isn't necessary when you do a minor brake-adjustment job, but it offers a good chance to check bearings, linings and possible hydraulic-fluid or grease leakage. Be sure to tighten the bearing nut properly.



AN OLD PAINTBRUSH does a fine job of cleaning dust from brakes. Use it to sweep out the drum as well as areas around the shoes, wheel cylinder and the other working parts. But don't use solvent. It might damage the lining.



LOOSEN ECCENTRIC LOCK NUT about one turn as first step in eccentric adjustment. Flat stem is for adjustment and for holding screw when lock nut is retightened. If cam stud refuses to



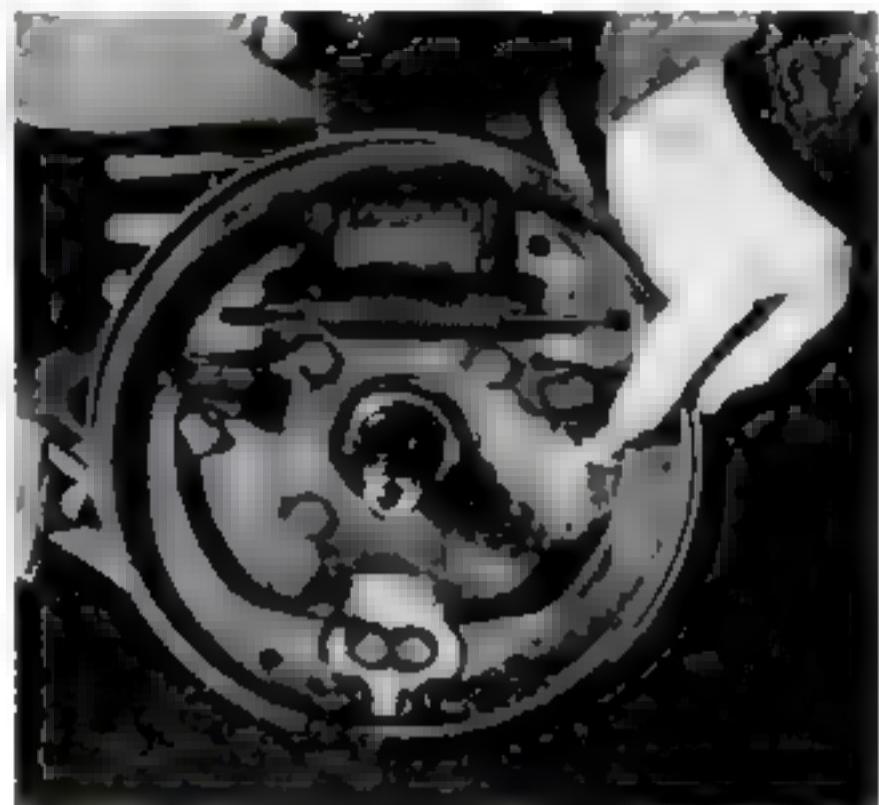
budge and a snug square socket isn't handy, try the rig shown at right. Invert a $\frac{3}{8}$ " drive socket and use another socket on a short hex bolt with a jam nut as the coupler.

Three common methods of adjusting car brakes

ECCENTRIC CAMS



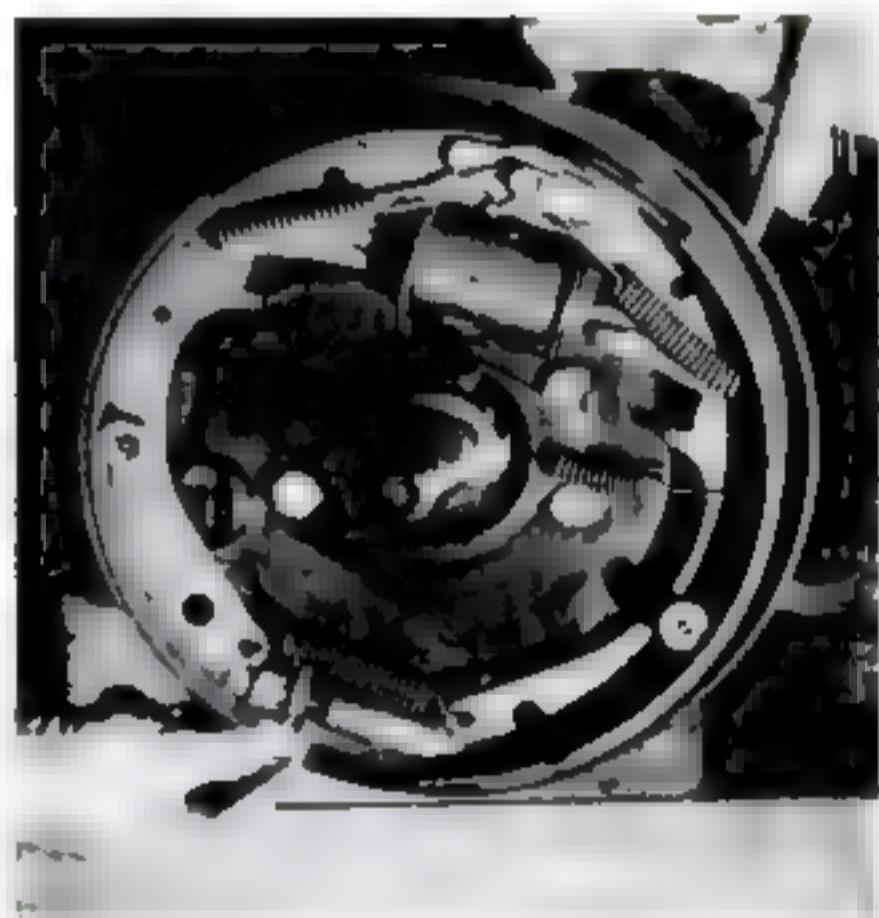
- 1 MOVE CAM OUT UNTIL WHEEL LOCKS;
BACK OFF SLIGHTLY TO FREE EACH
SHOE IN TURN
- 2 OPERATE BRAKES AND CHECK FOR DRAG



STAR WHEEL AND ECCENTRIC



- 1 LOOSEN LOCK NUT
- 2 SET SHOE TO .010" CLEARANCE
- 3 TIGHTEN LOCK NUT AND RECHECK
CLEARANCE
- 4 LOCK WHEEL WITH STAR-WHEEL
ADJUSTMENT AND BACK OFF TO FREE
- 5 OPERATE BRAKES AND CHECK FOR DRAG

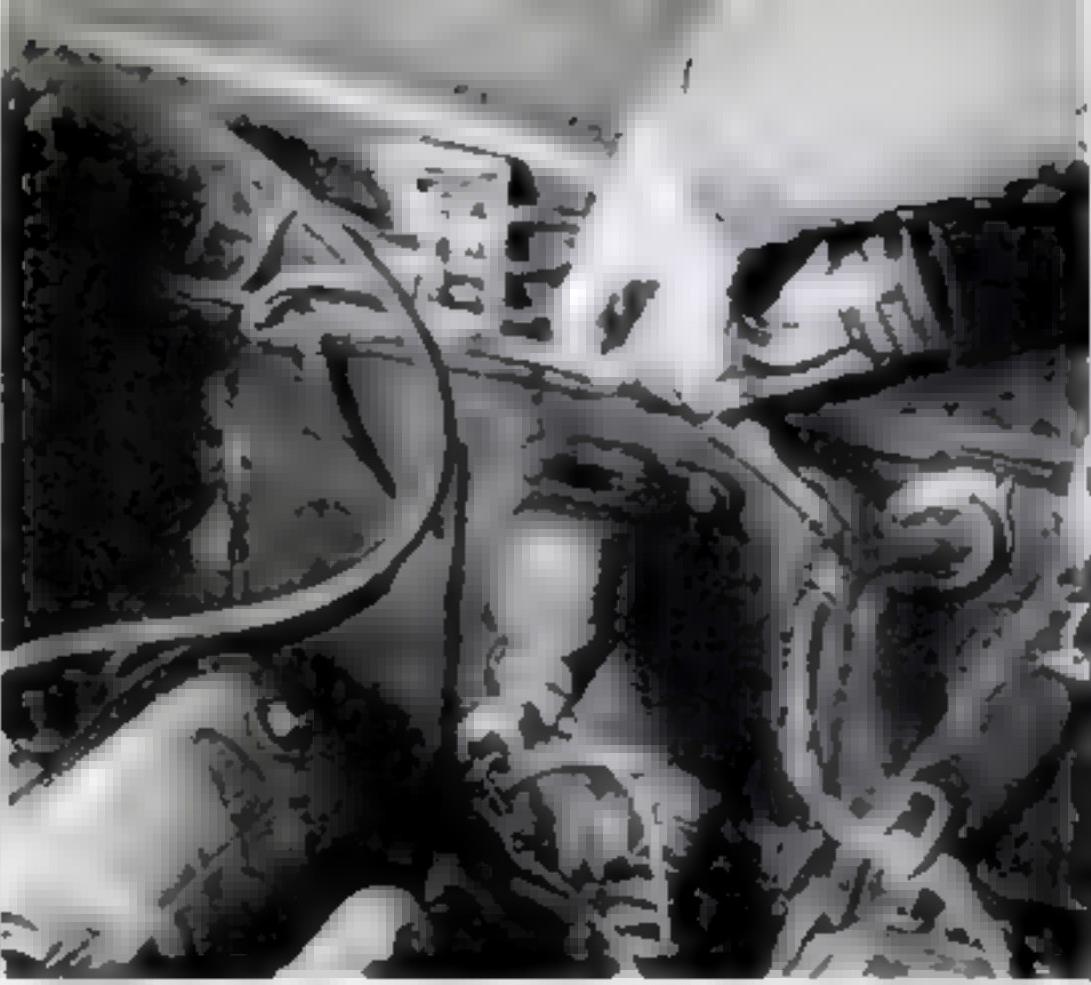


STAR WHEEL



- 1 PRY NOTCHED WHEEL TO TURN IT AND
LOCK BRAKE; BACK OFF TO FREE WHEEL
- 2 OPERATE BRAKES AND CHECK FOR DRAG





HYDRAULIC-LINE INSPECTION might save your life. You'll never have a better chance than during a brake job. Go over the hose and fittings for signs of leakage, drying out, or rubbed spots. Check the metal lines for kinks.

you scrape away the mud and road tar.

Since each shoe has a cam, you must adjust first the front and then the rear shoe on each wheel. There is nothing difficult here except that corrosion sometimes sets these parts to an eyeball-popping tightness that demands a good wrench and real manpower to move.

A combination of star wheel for final adjustment with an eccentric for initial adjustment is the third system, also very common. The eccentric is an innocent-looking little flat-sided screw with a lock nut. It turns much easier than the previously mentioned cams, once the lock nut has been backed off about one turn. You'll probably find that a very minute adjustment will lock the wheel solid. So be careful when retightening the lock nut that the adjusting screw doesn't sneak up a turn on you.

This type of brake often has a slot in the drum through which you can poke a feeler gauge, usually specified as .010" thick, to set the eccentric. This is the best method, but you probably will make out all right if you merely tighten the eccentric enough to lock the wheel and then back it off until the wheel is free. Follow this up similarly with the star wheel: Tighten to locked-wheel position, then back off slightly.

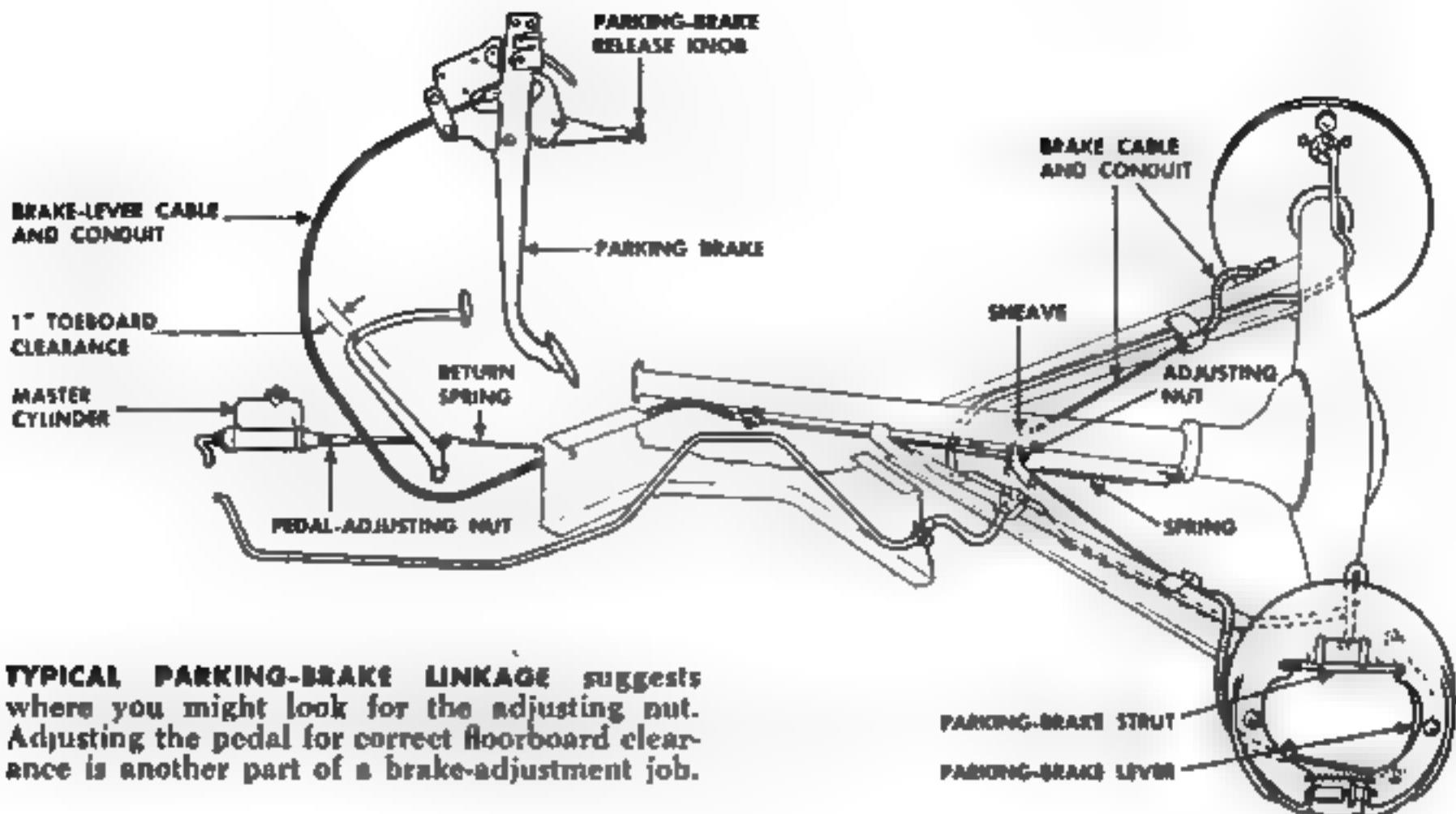
ADDING A LITTLE FLUID to master cylinder, to compensate for greater amount now remaining in wheel cylinders, is the final step in a brake job. Before removing the cover, be sure to wipe away all dirt from the surrounding area.

It's best to remove the wheels. If you go into a garage for a brake adjustment, the mechanic probably will do it quickly without removing the wheels. This is not necessarily wrong. It's certainly better than driving around with poor brakes. On the other hand a lot of dust accumulates in brake drums. To an inexperienced adjuster the noise of dust may sound as if the shoes are dragging. The result is that he backs off the adjustment too far.

Hence the writer recommends pulling at least the front wheels—if for no other reason than to check the condition of the lining and to study the construction of the brake so that you'll understand how the adjustment works.

Be careful to keep dust from falling into the wheel bearings. Repack the bearings with clean *wheel-bearing grease*. You may not care to pull the rear drums once you have the feel of adjusting on the fronts. As a matter of good practice, however, if the drums can be removed without resorting to heavy-duty pullers, cleaning is worthwhile.

When you replace a wheel, use care in tightening the bearing nut or you may wind up with shimmy and fast tire wear. The recommended method is to pull up on the nut until drag can be felt



TYPICAL PARKING-BRAKE LINKAGE suggests where you might look for the adjusting nut. Adjusting the pedal for correct floorboard clearance is another part of a brake-adjustment job.

when the wheel is turned. Then back off to the closest cotter pin. If the nut doesn't seem to have a slot in quite the right spot, cut a thin shim washer and put it between the nut and bearing outer washer.

The entire operation can be summarized as follows: Jack up the car and adjust either the star wheel, the eccentric and star wheel, or the front and rear cam on each wheel to lock the wheel. Then back off slightly for free running. Work the brakes and recheck for free running several times. When adjusting the rear brakes, be sure that the hand-brake cables aren't too tight and holding the brake in the on position, or that they are so loose as to be useless.

Check for an inch or so of free travel of the brake pedal on conventional brakes. (Power brakes use less free travel.) If you don't have at least an inch of free pedal travel on a conventional system, ease off on the connection between the pedal and master cylinder until you do. Failure to have this clearance may result in dragging brakes if the fluid in the system expands from heat and forces the master piston backward in the cylinder, and the pedal goes down before the lip of the piston cup clears the cylinder relief port.

Adjusting the hand brake. Before adjusting the rear brakes, it is a good idea to give a lusty tug on the cables leading to the hand-brake linkage. These are easily identified since in most cars they run from the rear-brake backing plates to some sort of pull-rod linkage under the drive shaft or transmission.

Tight cables could interfere with adjustment, so the instruction manuals all say to slack them off by loosening the adjustment nuts where the cables join the pull mechanism. Actually, the opposite is generally the case, with the cables sloppy enough to permit adjustment and stand a bit of tautening.

For a practical sequence, check the cables and loosen if needed; adjust the brake shoes and try the foot brakes; then snug up the cables so that they are just tight enough to get results when needed, but not so snug as to prevent complete release of the emergency system.

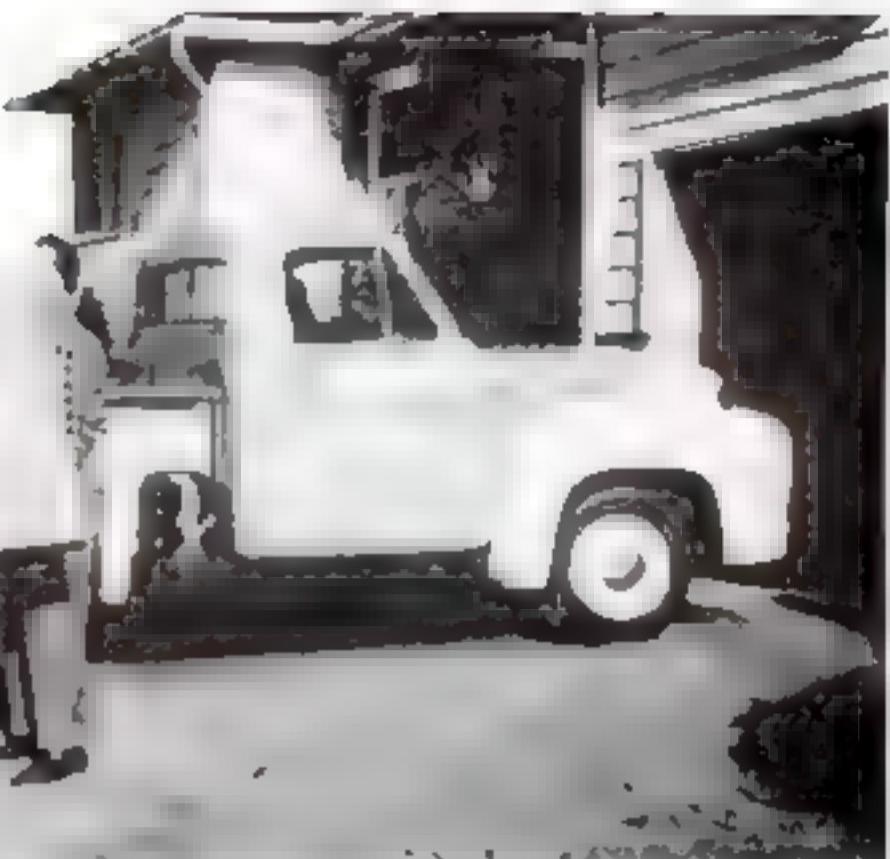
There are two ways to check for overtightening of the cables: One is to let some friendly driver flag you down and inform you that your rear brakes are smoking. A better way is to spin the drums by hand while someone works the hand brake to see if there is an inch or so of free movement before the drag of the wheels is felt.

END

New for Your Car

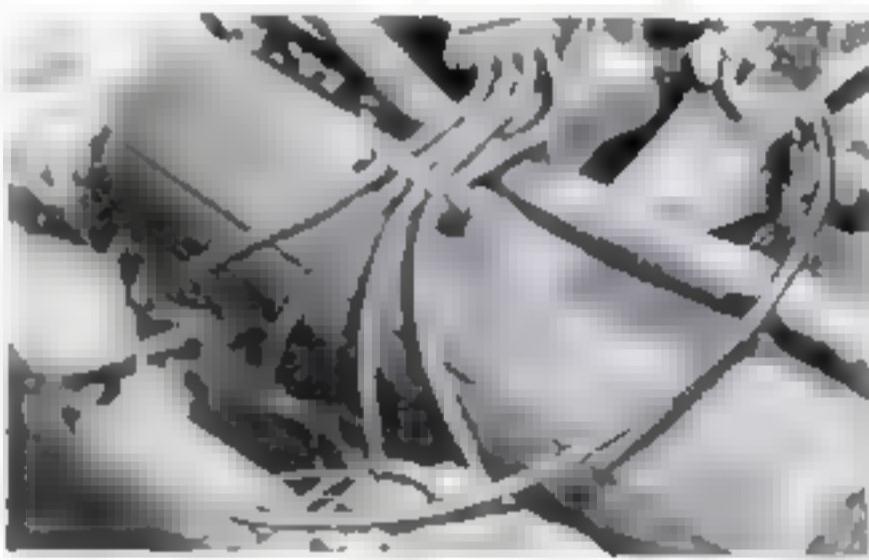


1. Plastic Cover Converts Pickup Truck. A one-piece plastic top, light enough for two men to install, will make a panel truck of a $\frac{1}{2}$ - or $\frac{3}{4}$ -ton open-bed pickup



The model shown above has windows and a rear lift door, another like it is windowless, and a third type, for sportsmen, has a shelf to carry a mattress.

2. Gauges Aim Headlights Fast. A pair of headlight adjusters fitted over any sealed beams, as below, permits checking in two minutes and accurate aiming in 10. Four calibrated levels show when your headlights are aligned. Suction cups hold the instrument on the lamps.

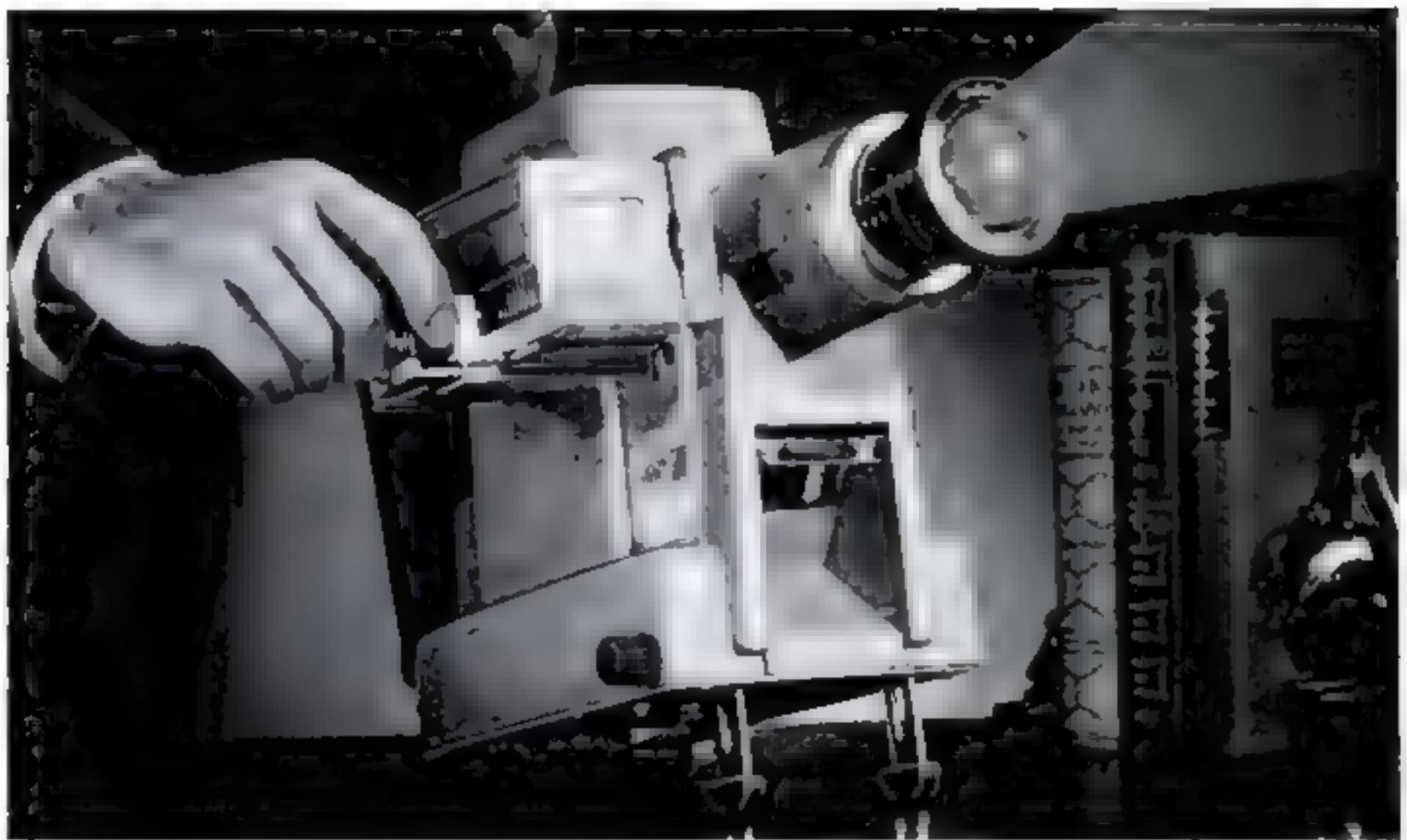


3. Needle Probes Insulated Plugs. When the old screwdriver-test method is difficult, you can contact the top of a spark plug by injection. This tester, grounded to the engine, has a 1" needle that is pushed through the housing. The needle hits the top of the spark plug and forces a cylinder miss if the plug is firing.



4. Trailer Hitch Slides Under Bumper. By turning the shank of this trailer hitch 90°, you can push it under the bumper when it is not being used. Tightening a setscrew locks it in place. A special model is made for station wagons.

Further information on these new car products can be obtained from: 1. Barrett Div., Allied Chemical & Dye Corp., 40 Rectar St., NYC; 2. Tralite Corp., Box 126, Los Angeles, Calif.; 3. H. C. Street Co., 11345 Telegraph Rd., Detroit 39; 4. Specialty Engineering, Inc., 391 Topping St., St. Paul 3.



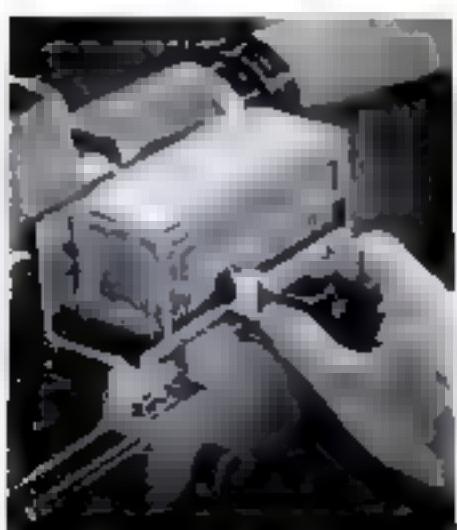
What makes a Kodaslide Signet an outstanding slide projector?



Quick, positive focusing for
needle-sharp images



All major controls grouped
conveniently together



Changer to feed, restore
slides, with push-pull ease



Air-cooled for your slides—
never even hot to the touch!

That's easy. Top-quality performance. For the thrill of brilliant, big-screen slide projection, you can't beat a Kodaslide Signet Projector. A fine Ektanon Lumenized Lens, together with close-coupled condensers, is your assurance of sharp, bright images of highest color purity.

And thanks to a 6-way selection of models, your Kodak dealer can show you a Signet with the features you want . . . at the price you want to pay. Prices range from \$59.50 for a Signet 300 with f/3.5 lens and single-slide changer, to \$89.50 for the Signet 500 Projector with f/2.8 lens and automatic changer. (Signet 300 with automatic changer, shown above, \$69.50.)

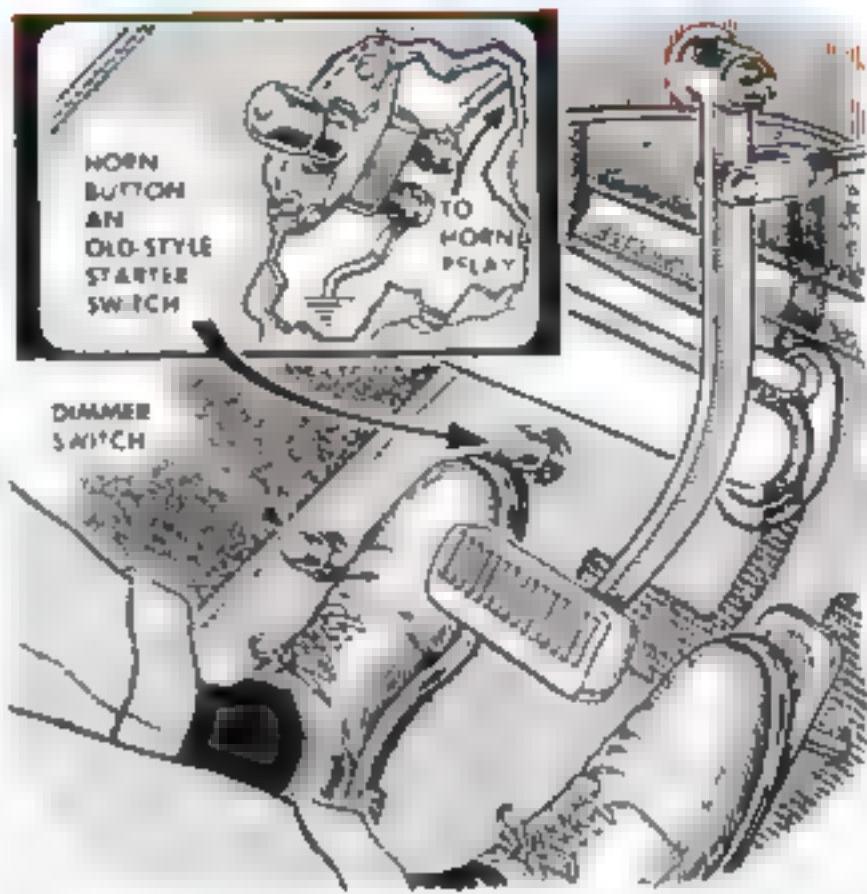
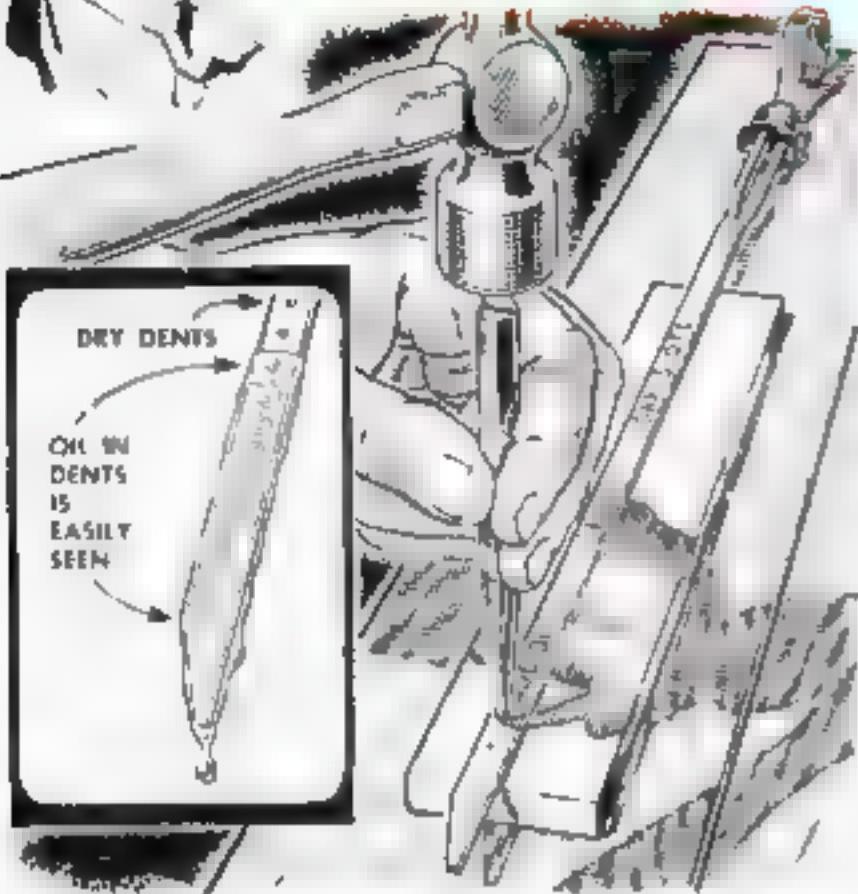
Prices are list, include Federal Tax, and
are subject to change without notice

Eastman Kodak Company
Rochester 4, N. Y.

Kodak
TRADE MARK

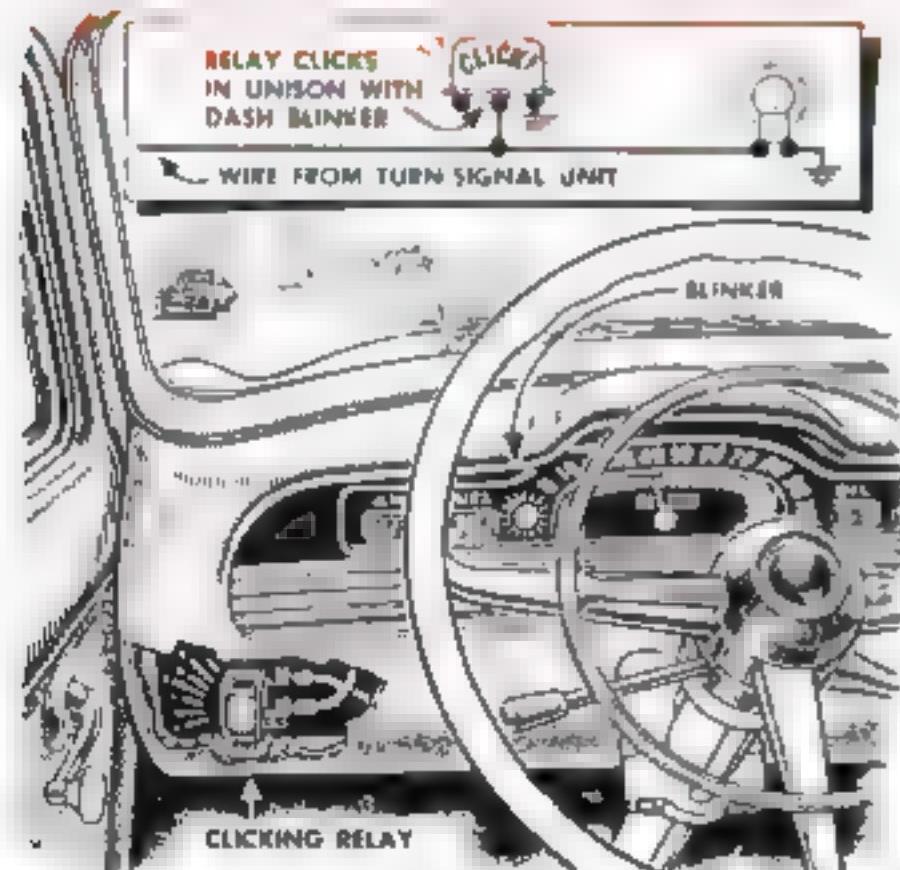


Hints from the Model Garage

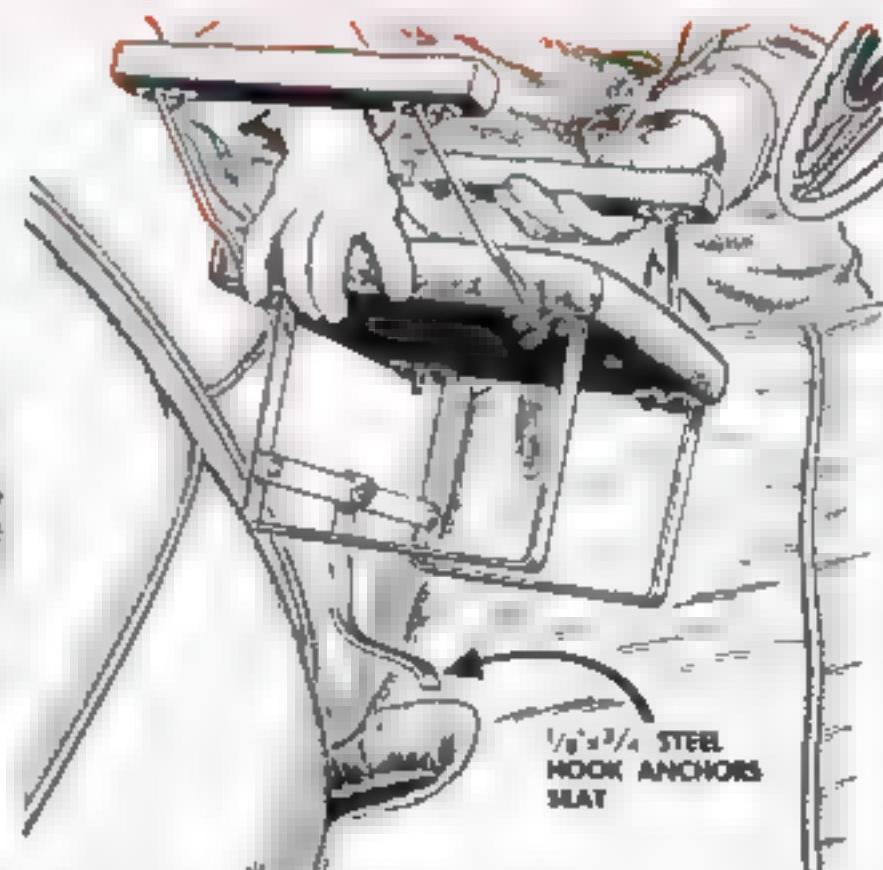


It's easier to check the oil in a warm engine containing light oil if you make a series of dents along the dipstick with a center punch. Oil held in the dents will be easily visible even when it's difficult to see any oil on the stick.

That idle left foot always bothers a veteran driver when he first drives a car that lacks a clutch pedal. Here's one man's solution—an auxiliary horn button on the floor. The switch is a single-pole, single-throw, normally-off job.



Safeguard against turn signals that continue to blink when they shouldn't by installing this added warning system. Wire a 6-volt DC relay in the circuit with the warning blinker. If you don't see the blinker, you'll hear the relay.



Anchoring a child's seat is a simple matter in cars with a center hole between the front seats. Bolt on a steel hook like this. Swing the hook in an arc through the hole to engage the seat securely, giving the child a safer ride.

5 MEN and 60 HORSES



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JAVELIN®	30 hp.	\$582.00
SEA-HORSE 30° ..	30 hp.	\$52.00
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*Electric Starting - Prices f.o.b. factory, subject to change. All models except the "3" have separate Micro-Master Fuel System, OBC certified brake to at 4000 rpm (30's at 4500).

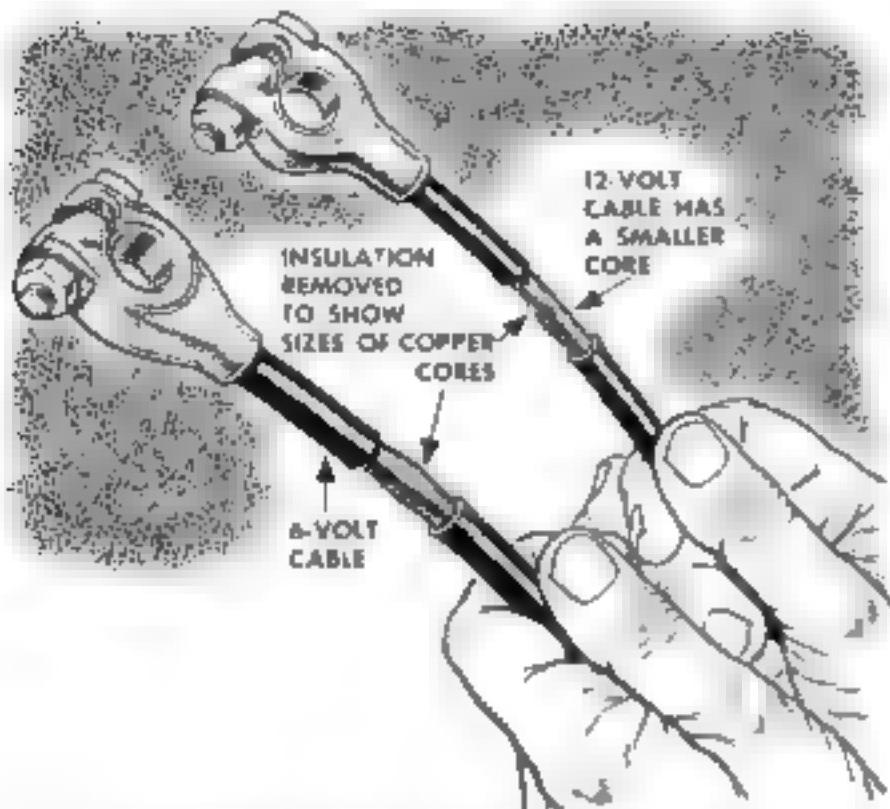
Who says big action lies beyond the range of average fishermen? Not with today's Sea-Horses. Their smooth and mighty power makes possible a new type of outboard fishing boat—fast, comfortable, seaworthy—with characteristic outboard maneuverability and inherent outboard economy! Ask your Johnson Dealer. Look for his name under "Outboard Motors" in your classified phone book. See the 1956 line — 9 models, 3 to 30 horsepower, all styled in beautiful Holiday Bronze. Featuring new Cruising-Range Fuel Saver (in the 30's) and Stall-Proof Idling. Easier Starting. And quiet!

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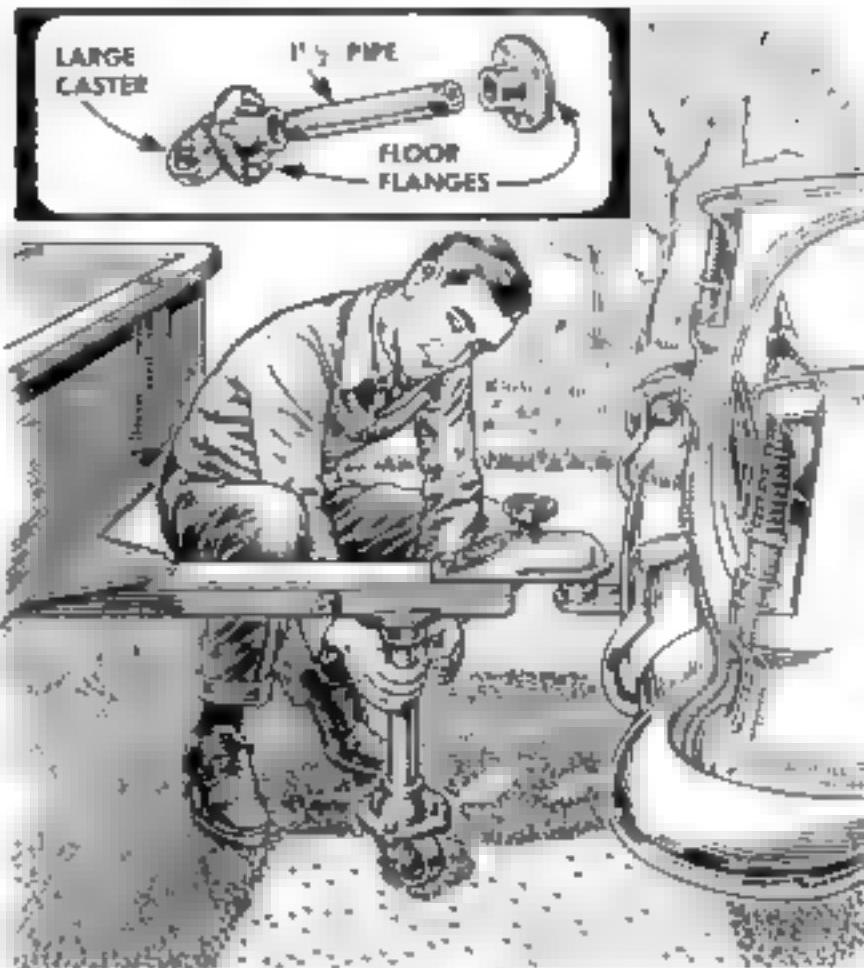
JOHNSON MOTORS, 500 Pershing Road, Waukegan, Illinois
A DIVISION OF OUTBOARD MARINE & MANUFACTURING COMPANY
In Canada: Manufactured by Johnson Motors, Peterborough

Johnson Sea-Horses are famous for DEPENDability

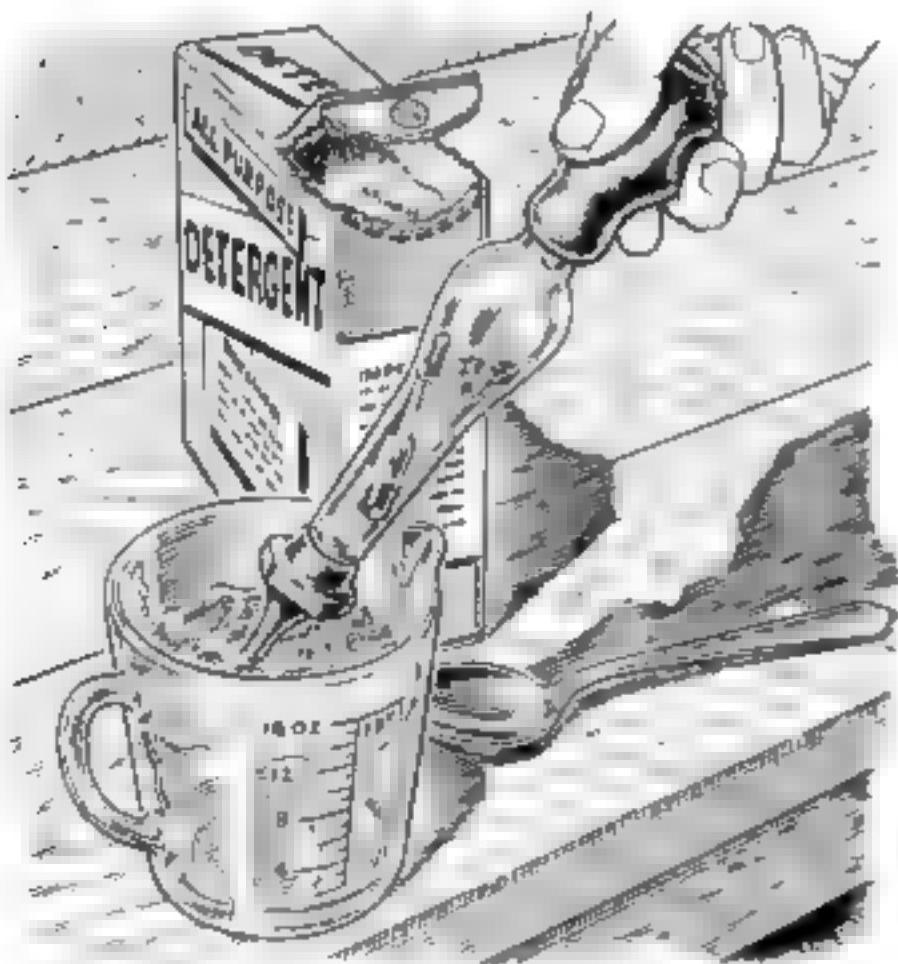
More Hints from the Model Garage



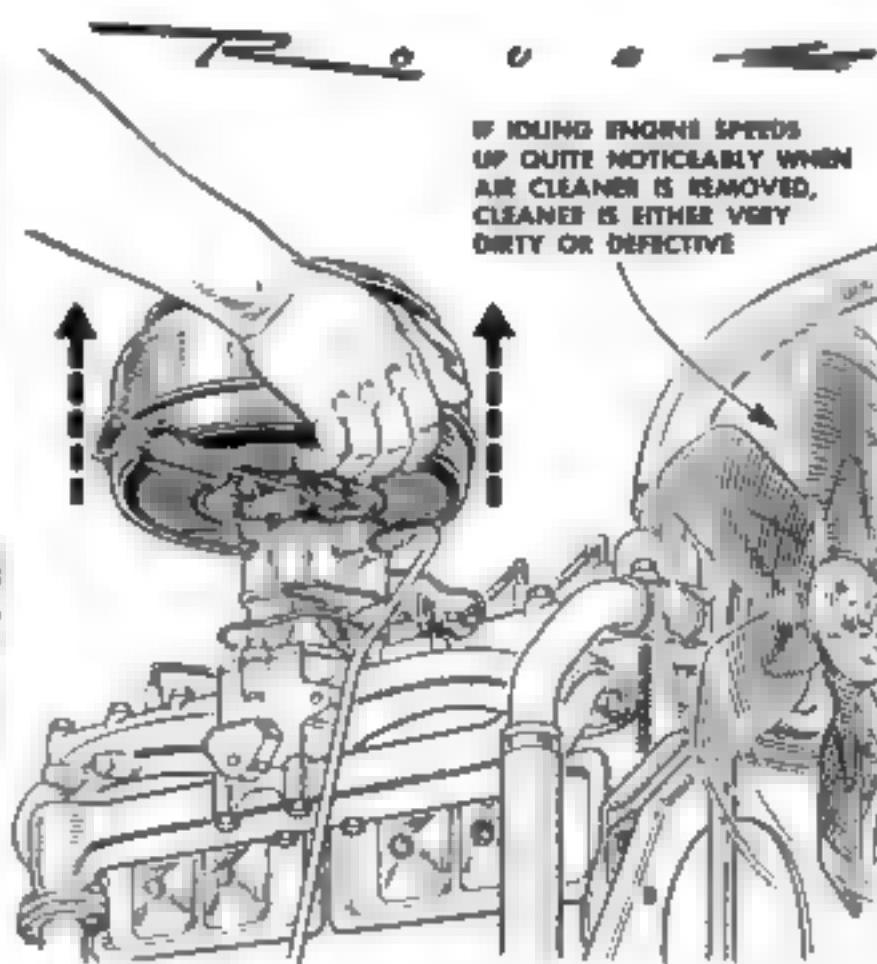
A 6-volt battery cable on a 12-volt car works fine, but don't try it the other way around or you'll get sluggish action. The reason? To save copper, manufacturers make 12-volt cores smaller since they must carry only half the amperage to produce the same wattage (volts \times amps).



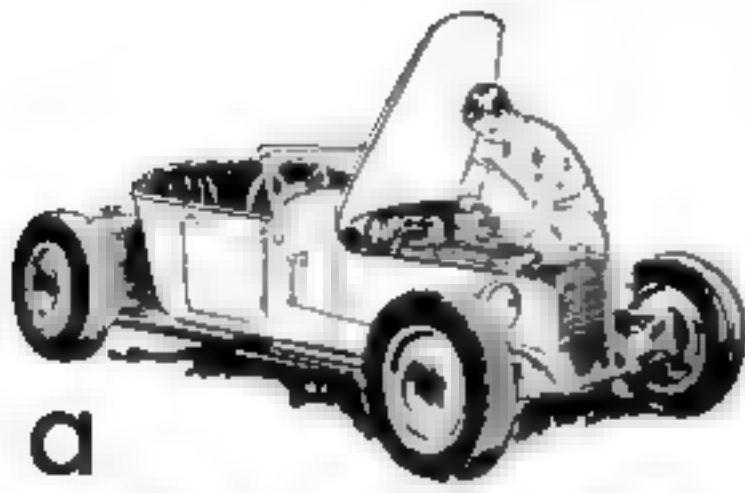
A removable caster like this will keep a small trailer level when it's unhitched—and make it easier to shove around. Bolt the flange to the underside of the tongue. Carry the rest of the caster unit in the trailer or tow car. Before unhitching screw the pipe into the flange.



A battery hydrometer may get dirty and milky inside after long use. To clean, dissolve a tablespoon of detergent in a pint of warm water. Suck the solution into the hydrometer and let it stand for a half hour. Then rinse with clean water.



An air cleaner that's dirty outside is undoubtedly dirty inside. So you ought to clean it. Idle the engine as you take it off. If the engine begins to run faster, you can be sure that the cleaner is very dirty—or not functioning properly.



got a

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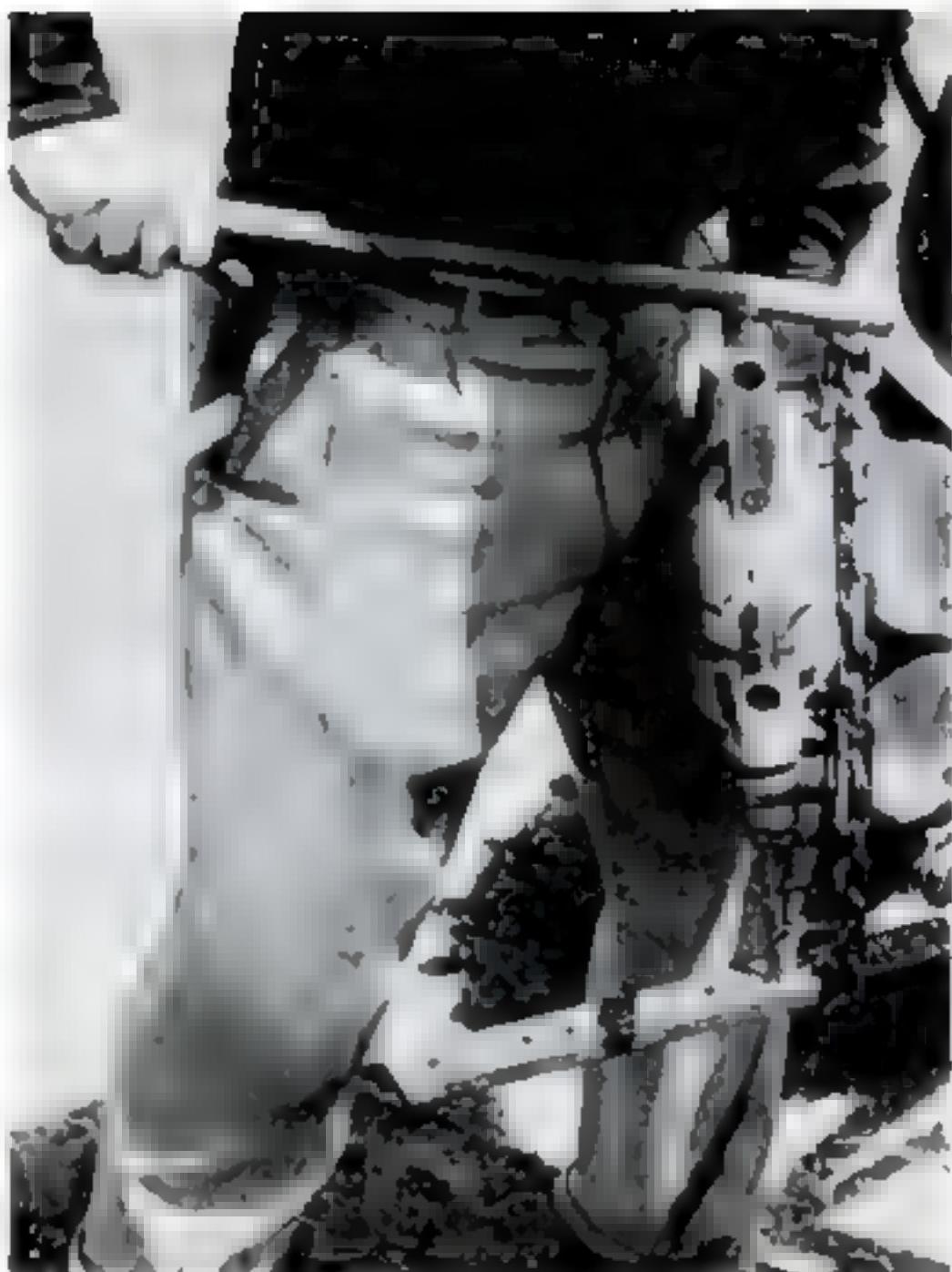
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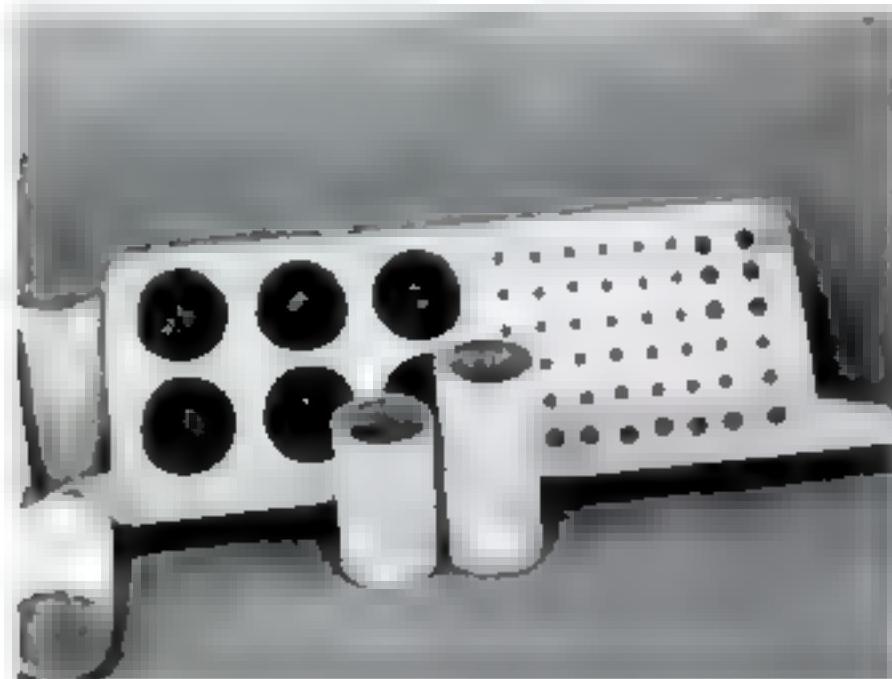
Drilling of Long Work Speeded by Chain Rig

WHEN drilling work supported only at one end, a rig like the one at right gives you leverage and holds the other end of the work steady against the bit. Weld the end of a chain to a pipe, and also weld to the pipe a small knob to fit into a hole in the drill handle. Hook the chain around the work near the spot to be drilled. As you push, the work is pulled into the bit.



Simple Rasp Faces Edges

METAL lath nailed to a piece of two-by-four makes a handy rasp for dressing rough edges of sheetrock or similar materials. Bend the metal around the long edge of the wood block and nail the two sides. Unlike a regular rasp, this tool won't gum up.—W. Howe, Longview, Wash.

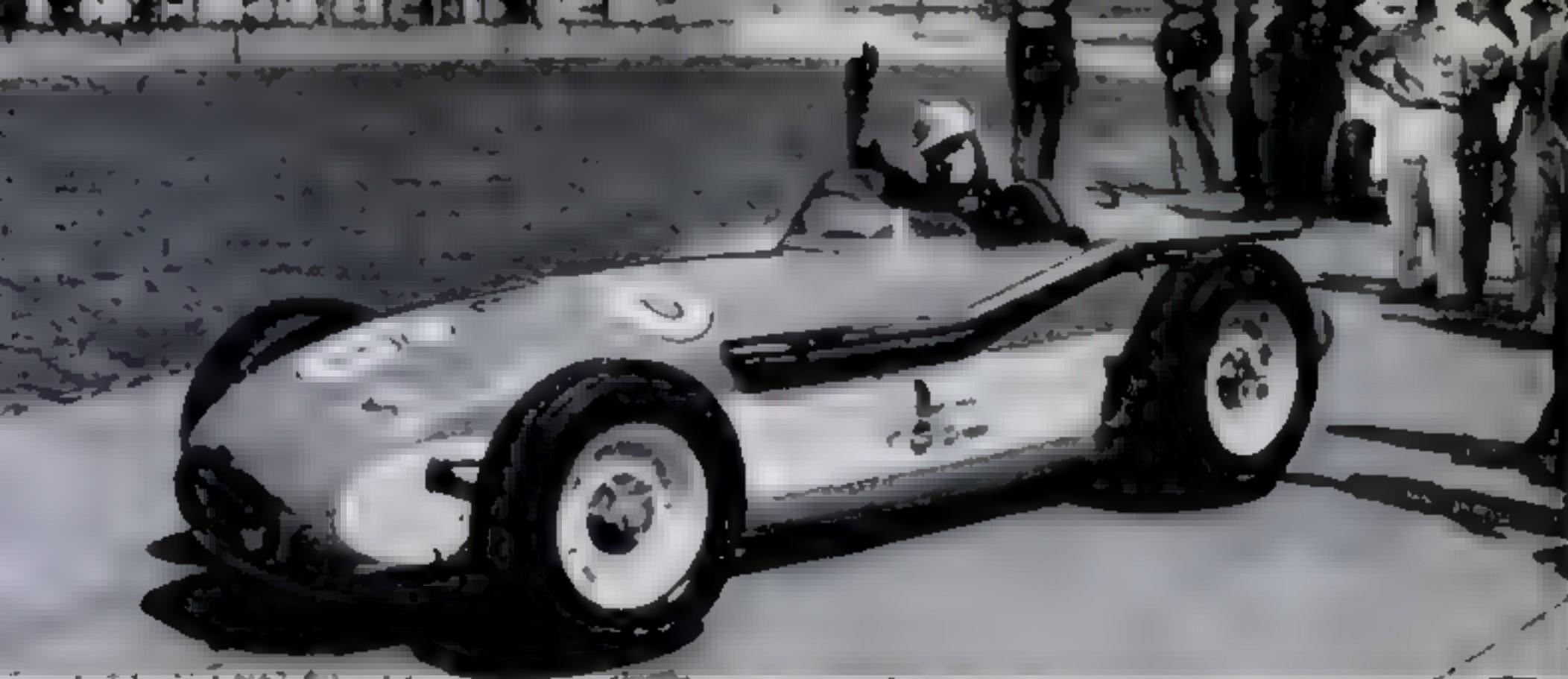


Mail Tubes Form Rack for Storing Saw Blades and Small Tools

POCKETS made from cardboard mailing tubes keep small jigsaw and saber-saw blades neatly sorted in this rack. I cut the rack from $1\frac{1}{2}$ " pine about 6" wide by 15" long, leaving on a short shoulder at each end to screw to the wall. Six sections of 2" mailing tube were sawed to various lengths to take different sized blades, and were glued into holes in one

section. Circles of $\frac{1}{2}$ " pine were glued and tacked on for bottoms.

In another section I drilled several rows of holes, some part way through to hold small machine files and some all the way for screwdrivers, punches and awls. I then sanded the top smooth and applied a coat of shellac for a slick finish.
—Dick Hutchinson, San Gabriel, Calif.



AAA Champion Bob Sweiikert—won at Indianapolis and placed in six other "big car" races.

Biggest winners in AAA and NASCAR races prove Champions best for your car!

Bob Sweiikert and Tim Flock used 5-rib Champion Spark Plugs in every one of 43 races!

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Bob Sweiikert, 1955's AAA
champion—who finished first in
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Tim Flock, the year's top
NASCAR winner, drove his
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evidence could there be that
Champions are best for your car,
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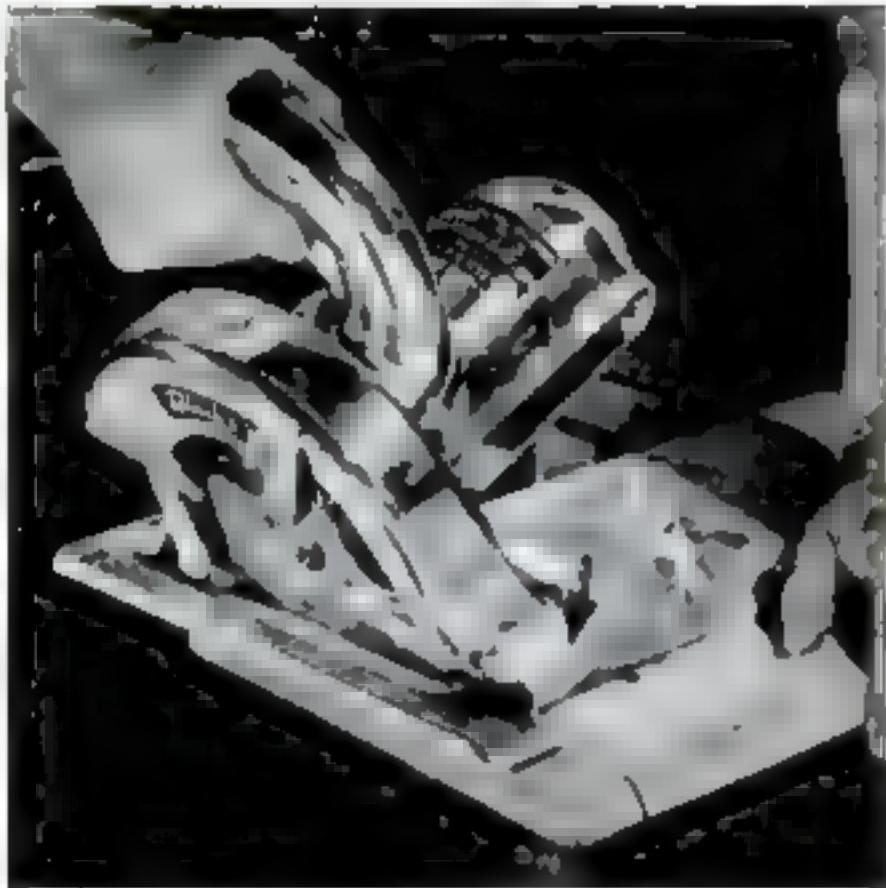
CHAMPION

LOOK
FOR THE 5 RIBS

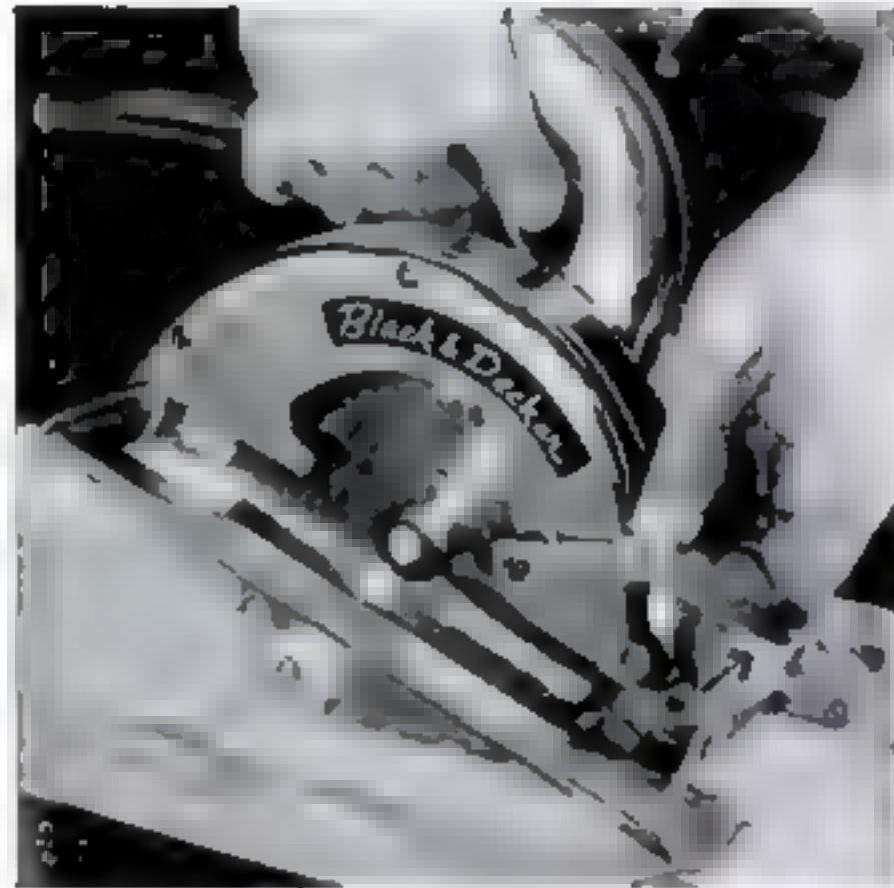
NASCAR Champion Tim Flock: Champions powered his Chrysler "300" to 18 wins, 15 placings.



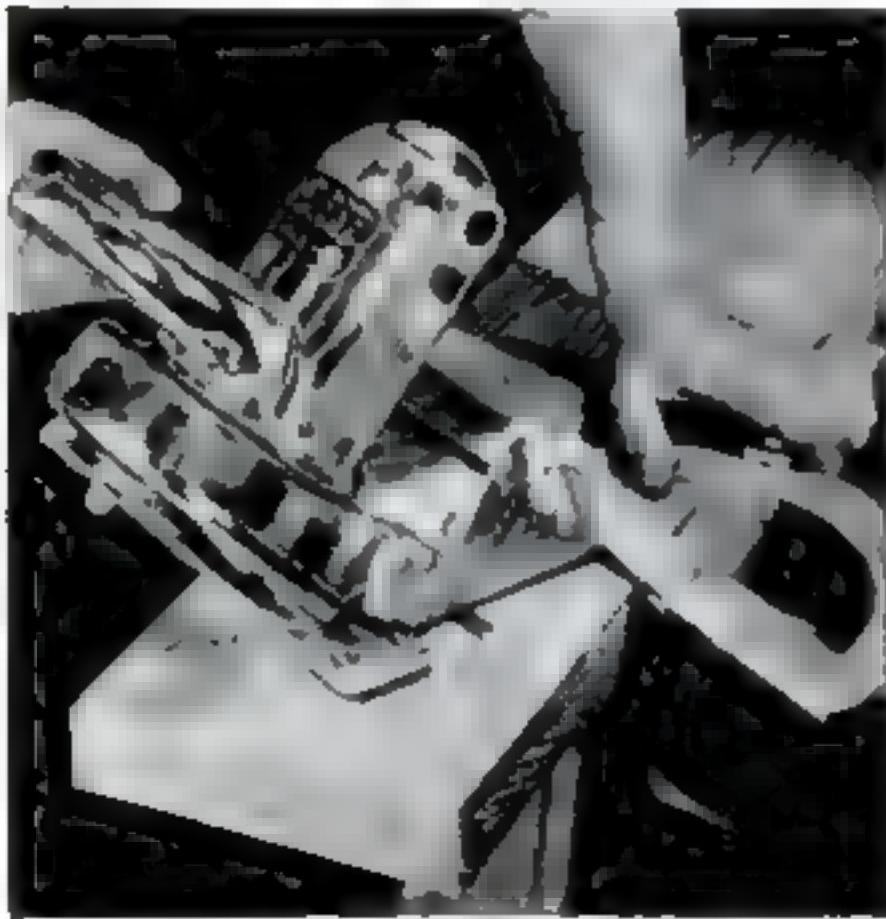
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Quick Heat for Shop Jobs

BURNING a pill-size fuel can give you enough heat to braze metal, melt glass, or do any of a number of jobs around the shop that require a hot flame. The tiny tablets with the big name—hexamethyl-enamine—are available at drugstores for about 50 cents a hundred.

The pills light easily with a match and take fire slowly, reaching an intense, almost invisible flame. With the setups shown, you can do many jobs that would normally require much heavier heating equipment.

The baby blowtorch made from an old ball-point refill delivers a hot, pinpoint flame that easily handles delicate, high-temperature silver soldering and brazing. To make one, pry the ball out of the pen's tip and enlarge the opening with a knife if air doesn't blow through it easily. Swab out the barrel with a pipe cleaner and attach a short length of rub-



QUICKIE STOVE for heating glue is made by punching three broad-head roofing nails part way through the rim of a tin-can lid. Place two or three tablets on the lid and renew them as they burn away. Glue and other liquids are best heated in a double-boiler arrangement of two cans of water, to prevent burning by hot flame.

ber hose to the rear end. You provide the blow by puffing into the tube.

Each tablet burns for about three minutes. One tablet is enough for softening, bending or drawing glass tubing. Use two tablets for glass blowing. With the blowtorch you can soften small areas and join seams in glass.

For quick heating of glue, test tubes, small bits of plastic and other materials, you can make a simple legged stand out of a tin-can lid. The tablets are safe if kept or carried in a closed jar. But once you light one, don't let it roll into some inaccessible place where it might start a fire before you could reach it.—Kenneth Murray, Colon, Mich.



YOU CAN BEND GLASS TUBING by holding it over a burning tablet set on the upturned bottom of a tea strainer. Strainer gives good ventilation, but be careful that the tablet doesn't roll off. A metal ash tray will also hold it.



BABY BLOWTORCH blows fire from hexamethyl-enamine pill into a fine, pinpointed flame just right for delicate soldering. Use an empty ball-point refill stem, and coil a length of wire to hold the tablet just ahead of the tip.

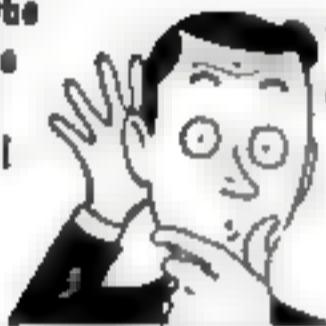
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Send me Syncro #900 Sander COD on 10 Day Rent Fee Refunded Offer. Within 10 days after Rental Period I may either (1) return sander prepaid to factory only (Syncro Corporation, Oxford, Mich.) for prompt \$20 refund. Or (2) I may pay dealer direct (named below, balance of \$19.95 and I will own sander. Offer ends July 1, 1956.

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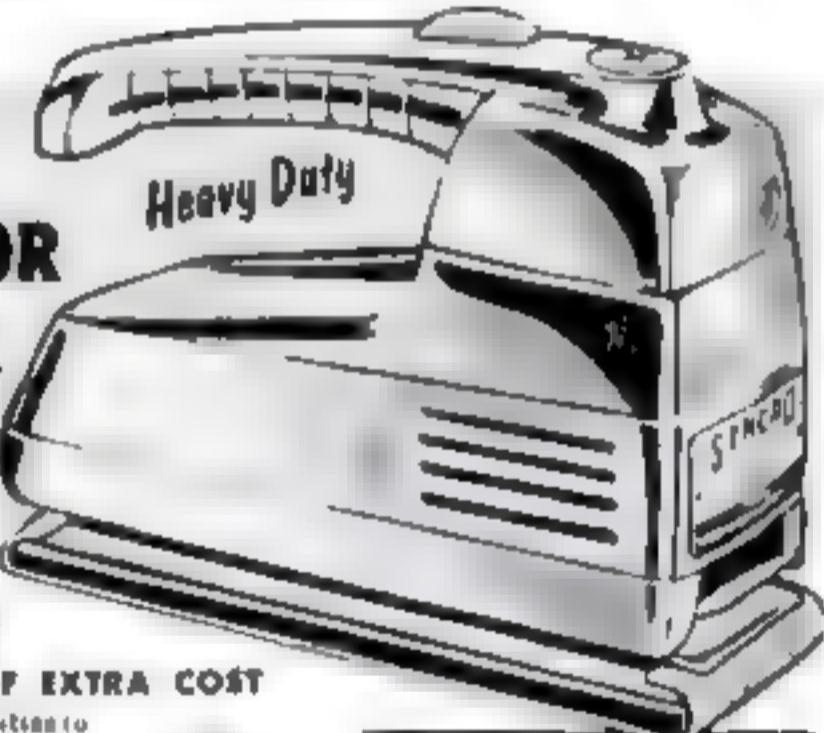
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Professionals claim it's the sanding pad motion that counts in surface removal. Today's army of over 22 sanders use 1 of 4 different "motions": Which motion will do that sanding job best in your home away from advertising claims and salesmen. We say exclusively Syncro MULTI-MOTION will BECAUSE most wood grain being naturally crooked and irregular—only Syncro Multi-Motion sanding pad action can sand with such grain and completely finish the whole surface! See for yourself accept our sporting offer shown below and get your next home sanding job done without having to buy any sander!



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In addition to the Free Sander—order immediately with your Rental and Sander if you buy sander after signing on this offer—send us two-in-one letter from dealer we'll ship you \$4 worth of aluminum filing.

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Dealers write on letterhead for complete Rental Sander dealer—for entirely different store operated—rent at their place that can increase sander sales 60% at Full Dealer Profit!

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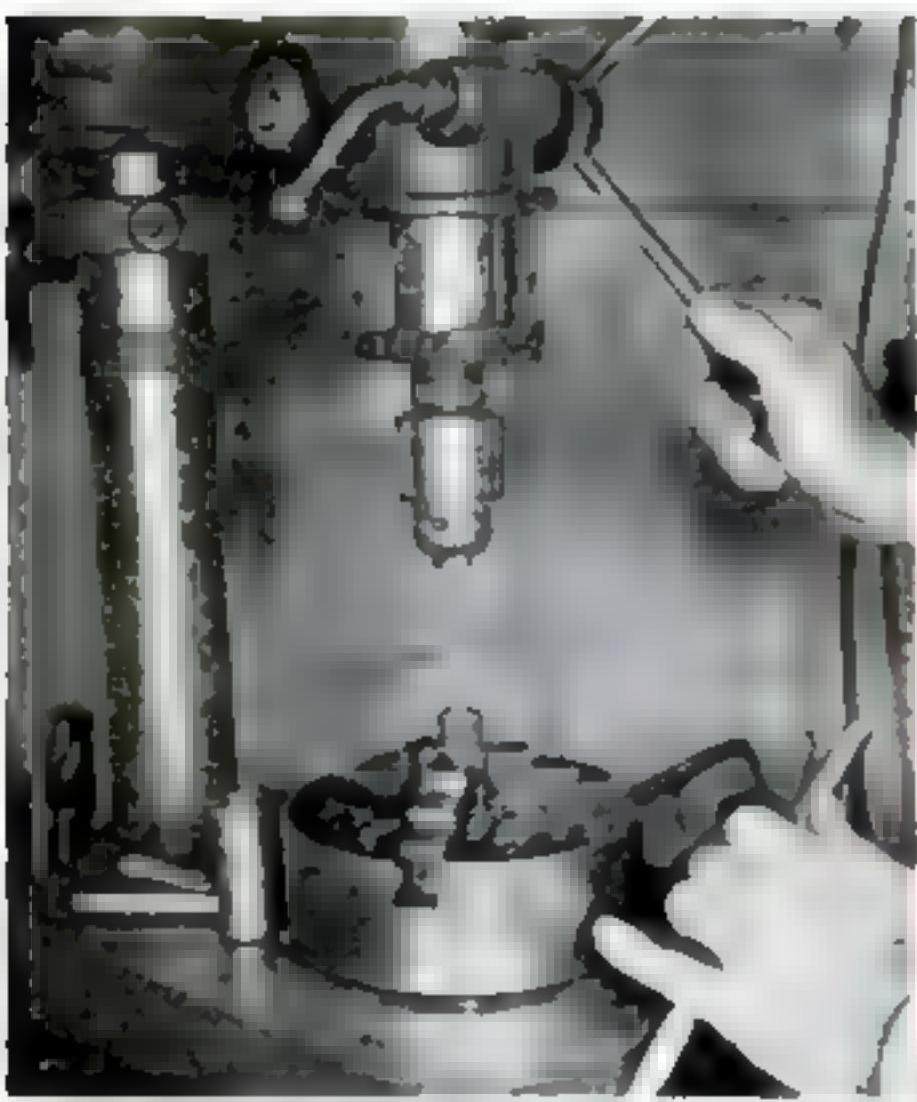
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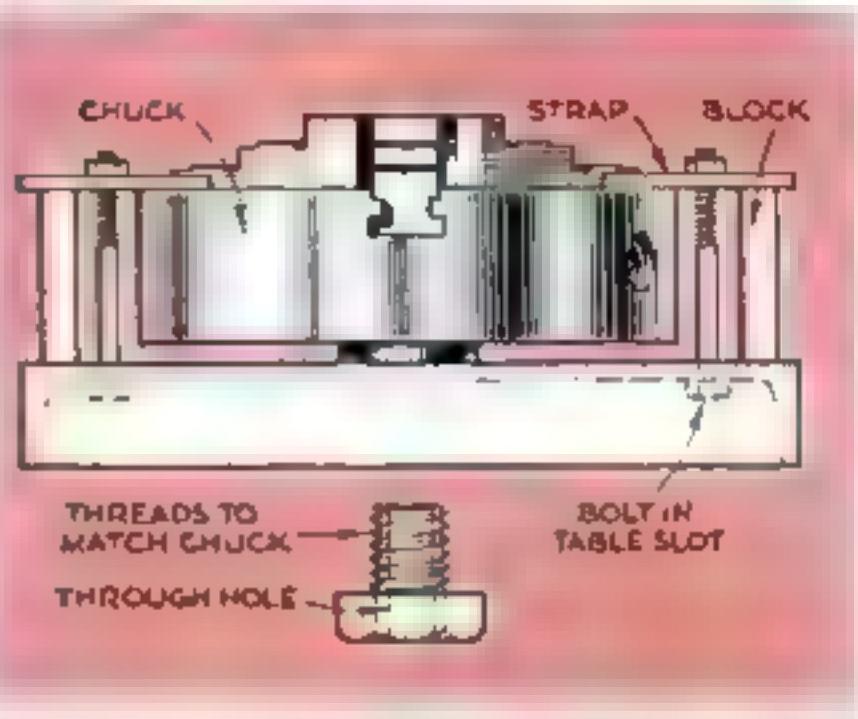
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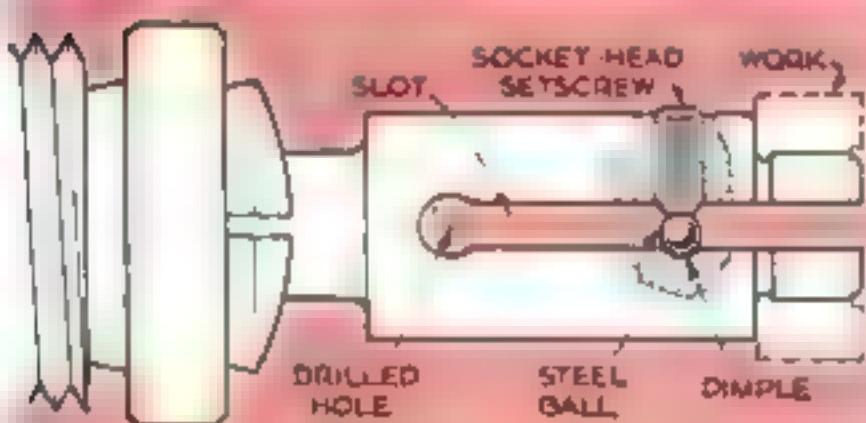


Chuck Centers Drill Work. Holes are automatically centered in round work if a lathe chuck is used as a drill-press vise. One way to mount it is with a hollow bolt threaded like the lathe spindle. Insert it through the table hole and tighten the bolt in the chuck body. Long work can pass through the bolt hole.

New Shop Ideas

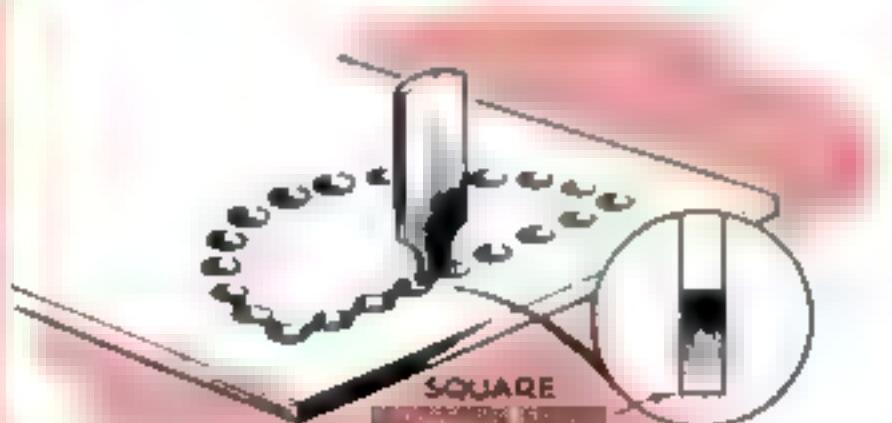


Hold-down straps, blocked up outside and held with long bolts, can also be used. To center the lathe chuck under the spindle, lock a $\frac{1}{2}$ " rod in it, bring down the spindle, and tighten the drill-press chuck on the projecting part of the rod. Then tighten the lathe chuck down. —*Phil McCafferty, Stanwood, Iowa.*



Arbor Grips from Inside. Useful for machining small rings and bushings, this arbor is turned between centers to fit a standard lathe collet. Drill a cross hole back from the end, mill or saw a slot to it. Run the setscrew tap drill through to form a dimple for a small bearing ball.

With the ball in place, tighten the setscrew just snugly. Then mount the arbor in the collet to turn the work-holding shoulder down to its final size.—*H. J. Gerber, Stillwater, Okla.*



Broach Cuts Between Holes. Big openings are often made by drilling small holes along the desired outline and cutting between them. This simple broach, made from a piece of power-hacksaw blade, shears the metal cleanly. Grind it, keeping the end square, not beveled.

Cut between two holes at a time by hitting the tool with a hammer. In steel thicker than $3/16"$, work from both sides. Wear goggles to protect your eyes from chips.—*Leonard A. Kroll, Brooklyn, N. Y.*

Look! Router At Work



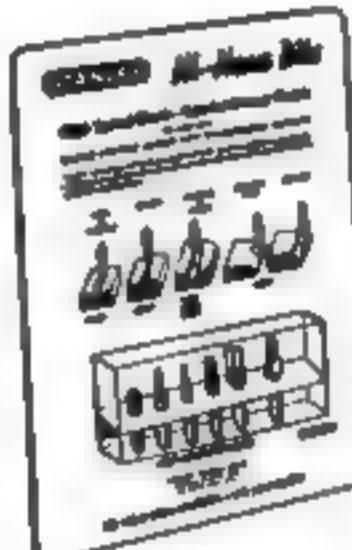
Those of you who have never used a router need only see one at work to be fascinated . . . need only try one to want it for your own shop.

The router shown here, cutting a decorative edge, is Stanley's No. H15. Its $\frac{1}{4}$ hp Stanley-built motor powers a wide variety of bits at a smooth cutting 27,000 rpm. For heavier duty we recommend the $\frac{1}{2}$ hp Stanley H45 Router.

Look Again! It's A Shaper



Now it's a shaper! The Stanley Router converts to a useful shaper when mounted on your work bench as above, using the special shaper adapter kit. Same router motor powers shaper. With H15 Router use Kit H127 . . . Kit H26 if you have H45.



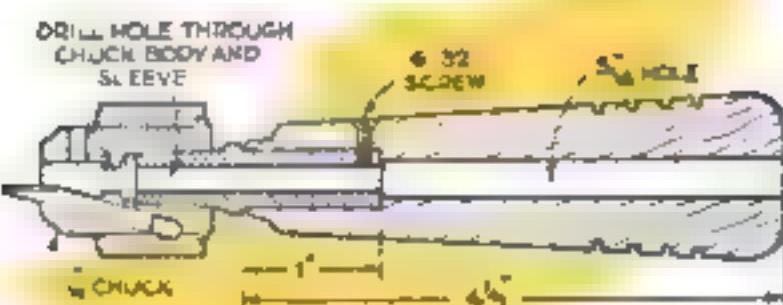
You'll want a variety of bits for your router. This H27 Assortment of "Hi-Hone" bits gives you 6 of the most popular. Your dealer has a full selection of Stanley bits and cutters for router and shaper. Start with the H27 pack and add as you need.

Stanley Routers are on display at your favorite hardware store or building supply dealer's. Ask for a demonstration. For further details send for Catalog 400. Write Stanley Electric Tools, 2503 Myrtle St., New Britain, Connecticut.



STANLEY

More Shop Tips



Handy Hand Chuck. A pin vise with a capacity up to $\frac{1}{2}$ " is useful for turning taps, reamers, drills and countersinks by hand, and for holding small round parts to be filed, ground or polished. It's easy to make one from a small drill chuck and spindle salvaged from an old hand drill, or with a new chuck and a mounting sleeve that is turned to fit it.

PUSH THE SLEEVE or spindle into the wood handle. Then drill tapping size for the retaining screw through both parts. Tap the hole in the metal sleeve; in the handle, open it to clearance size.

CHUCK CAN BE USED to countersink, deburr, ream or enlarge holes by hand (far left) or to hold work for hand jobs like filing. Long pieces can pass through the handle. The key-type chuck shown affords maximum grip.

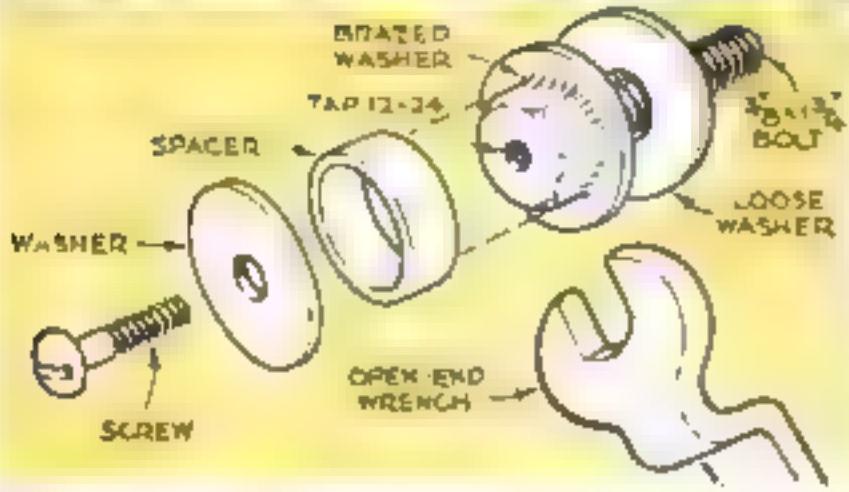
Open the chuck jaws fully so that a $\frac{1}{2}$ " hole can be drilled through the body as in the drawing above. Drill a similar hole through the spindle or sleeve.

Bore the wooden handle a close fit for this part, and drill a hole through the rest of the handle so that long work can pass through. Secure the chuck with a 6-32 screw.—Walter E. Burton, Akron.

Wrench Speeds Lathe Shift. Changing feed direction on some older lathes requires opening the gear case and using two hands and a wrench to loosen a lock bolt, shift the reverse lever, and retighten the nut. Here's how to make it a one-hand job, and one that you can do without swinging back the gear-case cover.

Replace the original lock bolt with a $\frac{1}{2}$ " hex-head bolt. Drill and tap the bolt head for a No. 12 screw, and braze a washer under the head. Add a loose washer, and screw in the bolt.

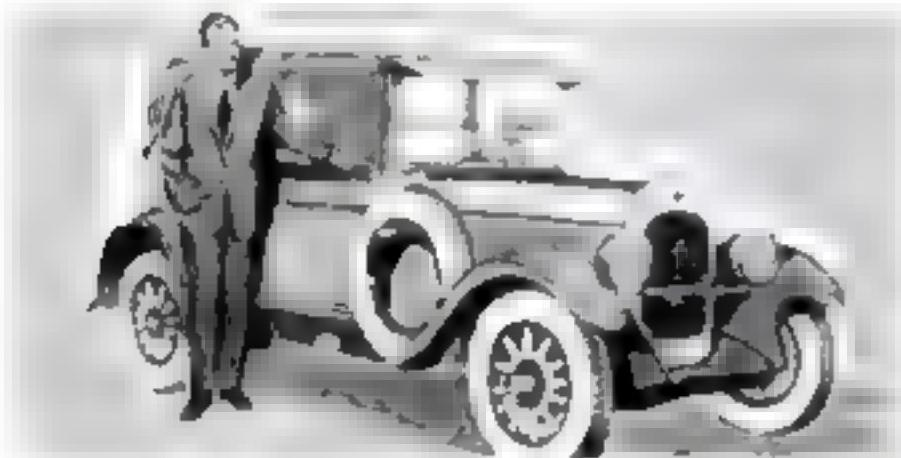
Saw the end off an inexpensive open-end wrench, and clamp it against the tight washer with a spacer cut from tubing big enough to pass over the bolt head. On the lathe shown, it was necessary to anneal the shank and bend it to clear the flange of the gear guard.—Howard G. McEntee, Ridgewood, N. J.





Bill Lundigan* shows how the Automobile engine has improved

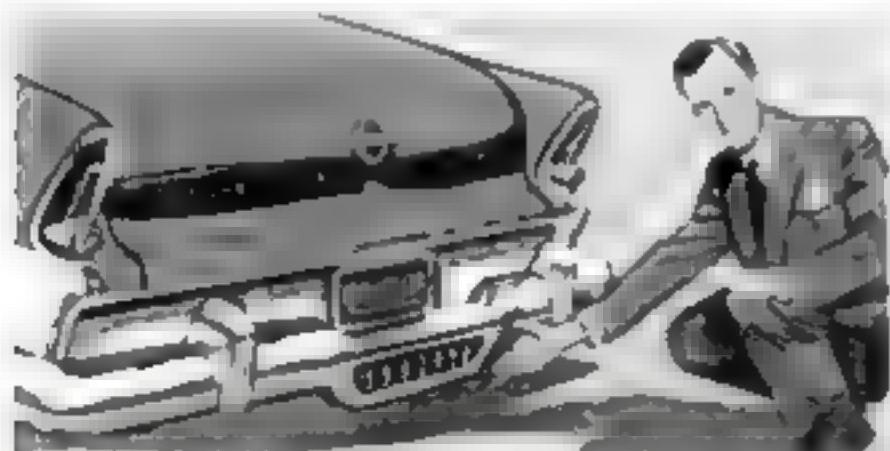
(*Your TV host on "Shower of Stars" and "Climax!")



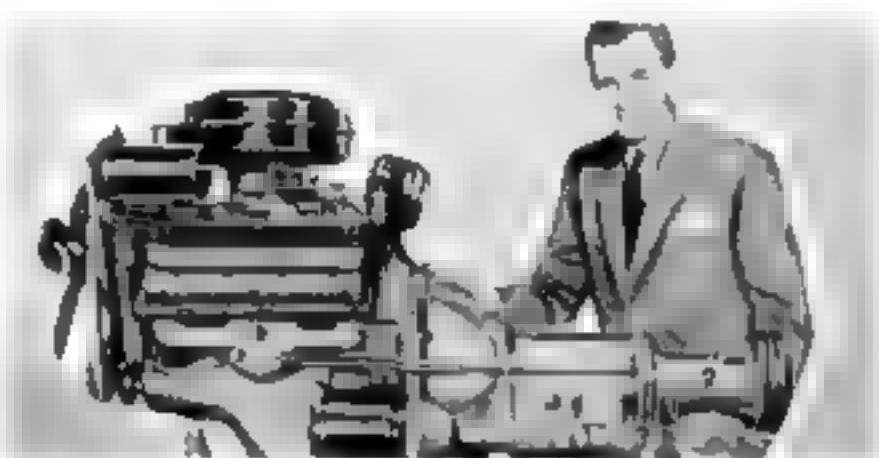
1. "BACK IN THE TWENTIES when the Charleston was the dance and cars had rumble seats, a young fellow named Walter P. Chrysler brought out a car with something the experts said wouldn't work—the high compression engine! It did work and became the standard engine for years to come."



3. "IN THIS EXCLUSIVE DOME-SHAPED CHAMBER fuel burns fast and clean and there are no corners to collect power-killing carbon deposits. No other engines operate at peak efficiency for so long a time. It's the first really new automobile engine design to appear in cars in 26 years!"



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6. "MORE AUTOMOTIVE FIRSTS" have been chalked up by Chrysler Corporation than any other car maker. Many have been copied, many are still exclusive with Plymouth, Dodge, De Soto, Chrysler and Imperial. All are reasons why you get more from a Chrysler Corporation car!"

CHRYSLER CORPORATION



THE FORWARD LOOK

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MARCH 1956 21

Gus Drives a Bad Bargain

(Continued from page 139)

when you clean out the tank." Stan Hicks began to protest, and then, looking shrewdly at Gus, closed his mouth.

IT TOOK 13 gallons to fill the 17-gallon tank. With the tank full, Gus started the engine easily, revved it up a few moments, got out, leaving it running.

"I'll bet," he said thoughtfully to Silas, "that the first thing you did when you were towed into the garage at Six Corners was to have gas put in—about three gallons, I'd say."

"How did you know?" Barnstable asked in astonishment. "Sure, I had three gallons put in. I had a quarter of a tank. That made enough to get me home, and it wasn't any cheaper at Six Corners than here in town."

"So," Gus said softly, "your gas gauge showed a quarter tank the first time you stalled, just as it did the second time."

"That's right," Silas admitted.

"Well," Gus said, speaking positively now, "you've got a break, a hole in the gas-tank suction pipe, inside the tank. That pipe reaches from the top almost to the bottom of the tank to draw gas. When your gas level got down to a quarter full, it uncovered the break, and the fuel pump naturally sucked air through the line instead of gas. If you'd filled your tank in the city, or at Six Corners, you'd have come home without any trouble."

"Hole in my gas tank!" Silas' thin features were indignant. "How much is that going to cost to fix?"

"That depends," Gus told him, backing to the bench and lighting his pipe, "on where and from whom you bought the car, Silas. Now if you'd bought it from our local dealer, he'd pick it up in the morning and install a new gas tank for you, free of charge. He might even manage to have your towing charges refunded."

"Tow charges refunded," Silas crowed. "Fifty dollars?"

"Plus my towing charges," Gus reminded him.

"But," Silas protested, "I bought this car from . . ."

"That's what I reckoned," Gus interrupted. "Maybe your outfit will take care of you, and maybe they won't. But in any event, Silas, they're 200 miles away."

Silas Barnstable's face was a picture of newly dawning dismay.

"But don't you worry, Silas," Gus went on, and Stan Hicks caught Gus's sly wink. "If they won't fix you up in the city, Stan and I will take care of you. Now let me see—installing a new gas tank, and then there's my towing charges . . ."

SILAS BARNSTABLE didn't wait to hear more. He stepped on the gas and drove out of the Model Garage, his lean chin thrust forward like the nose of a pointer.

"Man, is he burned," Stan Hicks chuckled. "But how, Gus, could you be so sure there was a break in that pipe?"

"I didn't get wise," Gus told him, "until the second time we blew out the gas line and put air pressure into the tank. The air pressure forced gas to flow from the disconnected line as it always does under such conditions. But with one difference. Raw air was introduced into the gas stream through the break above the gasoline level. That gas came through the line like carbonated soda pop. When I coupled this with the fact that Silas had stalled twice, each time with his gas gauge reading a quarter full, with a new car, I knew. Naturally, when Silas had three gallons of gas put in when he first was towed at the Six Corners garage, the mechanic there couldn't find anything wrong, and gave him some sort of a motor tune."

"I see," Stan said. "I wonder how much money Silas will really save, when he finally adds everything up?"

"I think," Gus told him, "that the old codger is about to learn a lesson in economics. Or maybe," he chuckled, "maybe he'll just keep his tank filled hereafter above the quarter level." END
NEXT MONTH: Gus meets a flood of trouble.

ROCKWELL-BUILT

DELTA

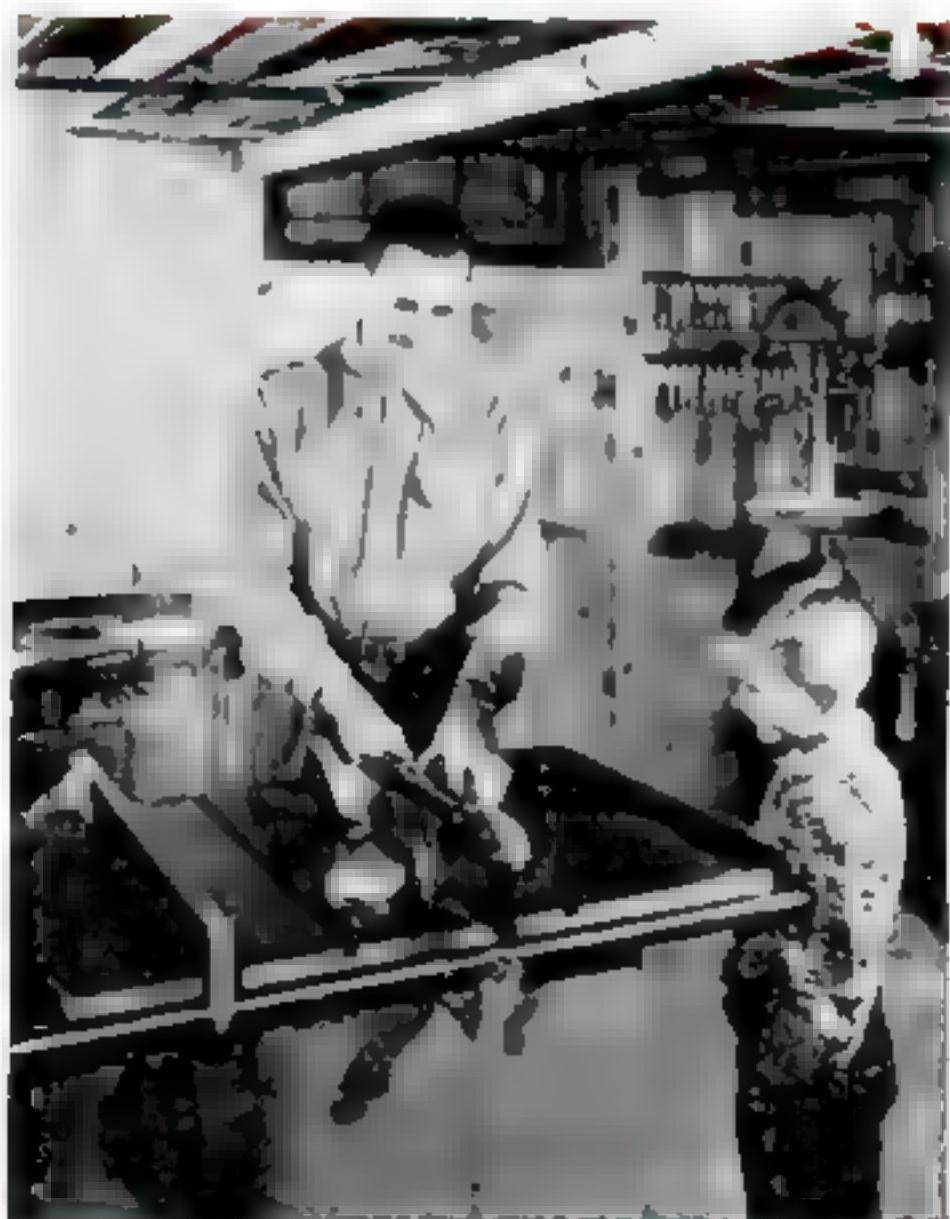
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Address _____

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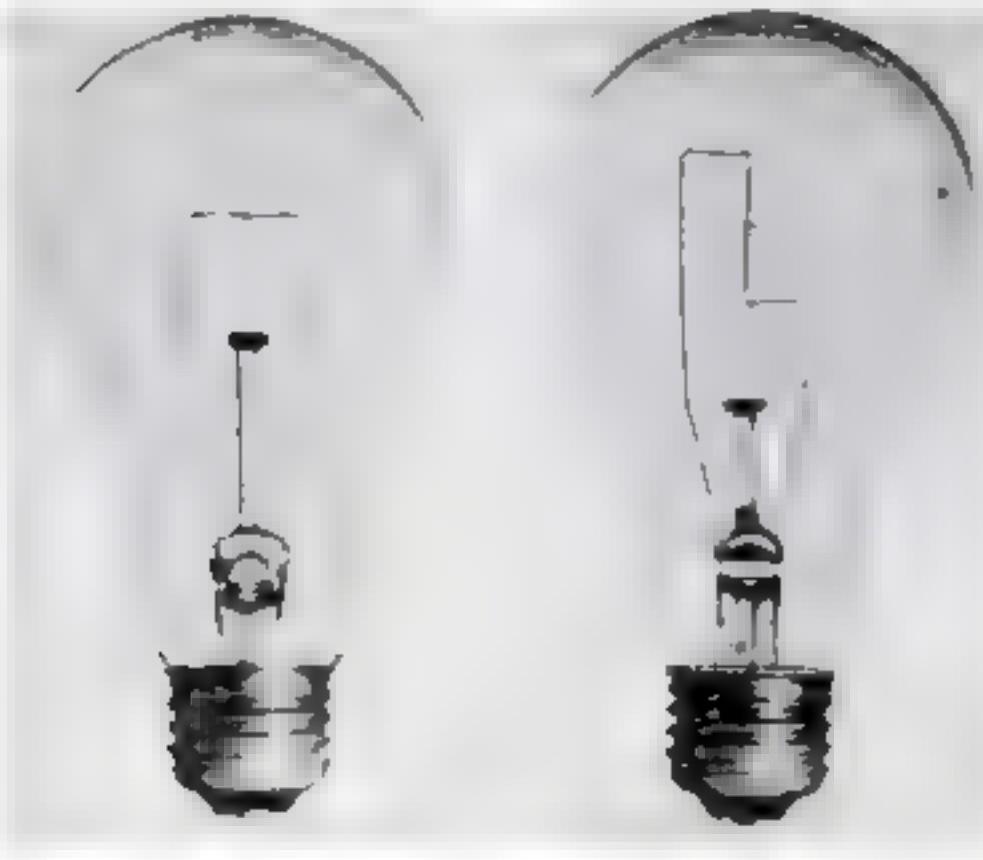
Spray-On Plaster Goes Up Fast

USING this adjustable nozzle, a compressor and a mixing unit, one plasterer now sprays on 1,800 to 4,000 square yards of plaster a day, about four men's hand work. E-Z-On Corp., Chicago, makes it.



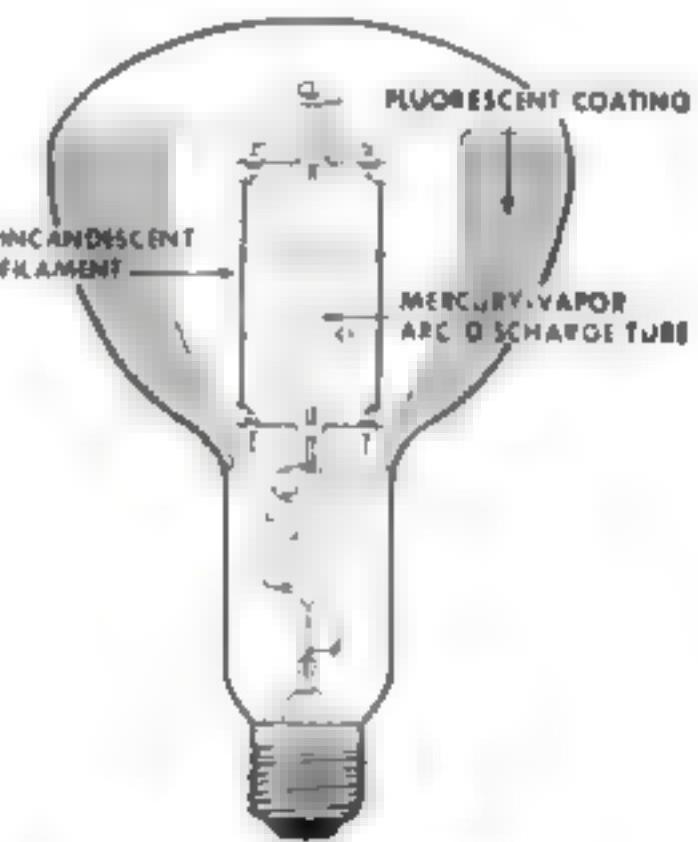
Parking Lot Keeps Cars Warm

OUTDOOR parking in winter is no problem in this parking lot in Norway. An electric heating unit is provided for each car space. The driver plugs in, and his radiator water is kept at 60 degrees.



New Light Bulbs: Axial Filament . . .

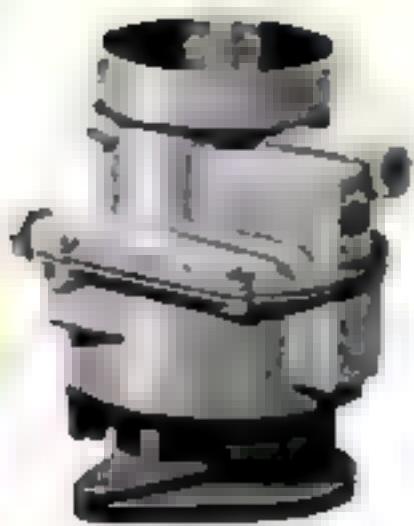
A SIX-PERCENT increase in light for household incandescent bulbs, 15 percent for high-wattage lamps, is in prospect with a new General Electric filament design. GE mounts the filament lengthwise (above right) instead of crosswise, as in the old bulb at left. This lets filaments burn hotter. New 750- and 1,000-watt sizes are ready now; smaller ones will be ready later on.



Three Lamps In One

TURN this bulb on, and its two incandescent filaments light, the mercury-vapor arc tube starts building up, and the fluorescent coating is activated by rays from the arc. The Fluomeric, developed by Duro-Test Corp., North Bergen, N.J., is rated at 12,000 hours.

QUIT FUELING AROUND.



Perfect partners in power! Rochester Carburetors are engineered for the newest high-compression engines.

No sense in playing "gas-ing" games! All fuels are fine—every one of today's high-octane gasolines delivers high-power, high-economy performance! But Rochester Carburetors are designed to really deliver the goods—to give you more performance, longer mileage between gas stops. So hop to it—specify Rochester when you're ready for a carburetor. Original equipment for Cadillac, Buick, Oldsmobile, Pontiac and Chevrolet cars.

ROCHESTER
PRODUCTS
DIVISION OF
GENERAL MOTORS
CORPORATION
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BY ROCHESTER
PRODUCTS



Naked Eggs Keep Fresh Longer

A WAY of packaging eggs in individual, sealed compartments, without shells, has been developed by Cornell University. The eggs, which will be marketed soon and may be cheaper, can be boiled or poached in their plastic containers.



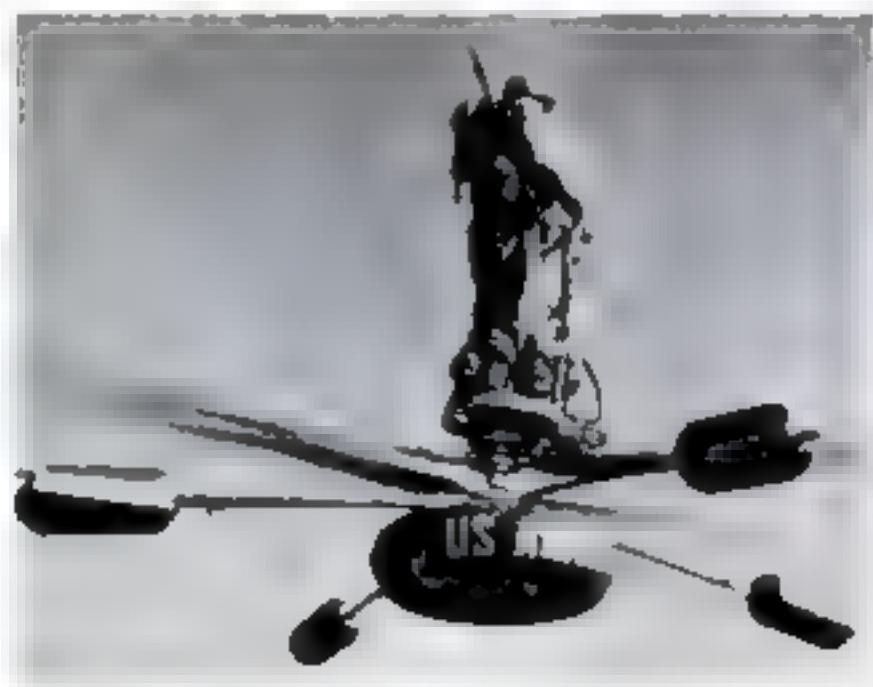
Suction Plate Grips Workpieces

OUT of Germany comes an ingenious device for holding awkward pieces while working on them. It consists of a vacuum pump attached to a swiveling, tilting plate that adapts itself to uneven surfaces and can be adjusted for height.



Canvas Makes Car a Lightweight

CANOELIKE construction, with canvas stretched over a tubular frame, brings the weight of this little Czechoslovakian three-wheeler down to 600 pounds. A rear motorcycle engine drives the car at 55 miles per hour. It will seat two.



GI Tries Out One-Man Airlift

TWENTY minutes makes an inexperienced soldier a proficient pilot of the Aerocycle, a 150-mile-range rotor craft that he steers by leaning the way he wants to go. A two-cycle Mercury outboard hits 65 m.p.h. The Army has 12.

NOW... SPORTS CAR FUN IS FAMILY FUN!



The fabulous **GOLDEN HAWK**—275 hp . . . most power-per-pound of any American car . . . room for 5!

0 to 60 mph. in 8.7 seconds, 60 to 100 mph. in 17.7 seconds! Torque, 380 ft. lbs.—at 2800 rpm.; engine, 352 cu. in., V8; OHV; bore 4", stroke 3.50"; brake area, 195.3 sq. in.—biggest, safest, braking-to-weight ratio of any car. 4-barrel carburetion. Ultramatic Drive and all power assists available. Engineered to out-handle and out-run sports cars costing thousands more.



Now you can have the true sports car you've always wanted—and share the fun with family and friends! Take a look at that 5-passenger spaciousness, the luxurious appointments, the

huge touring-car trunk—but don't be fooled. Behind that racing-type grille, under the sleek European styling is a real sports car—a hurricane of power that handles like a dream!

And there are four different Hawks to choose from—4 power choices, 4 degrees of luxury, 4 price ranges—including the lowest!

Put yourself in a Hawk—just for the fun of it—at your Studebaker Dealer's today!

Tune in "TV Reader's Digest" every week

Studebaker *Hawks*

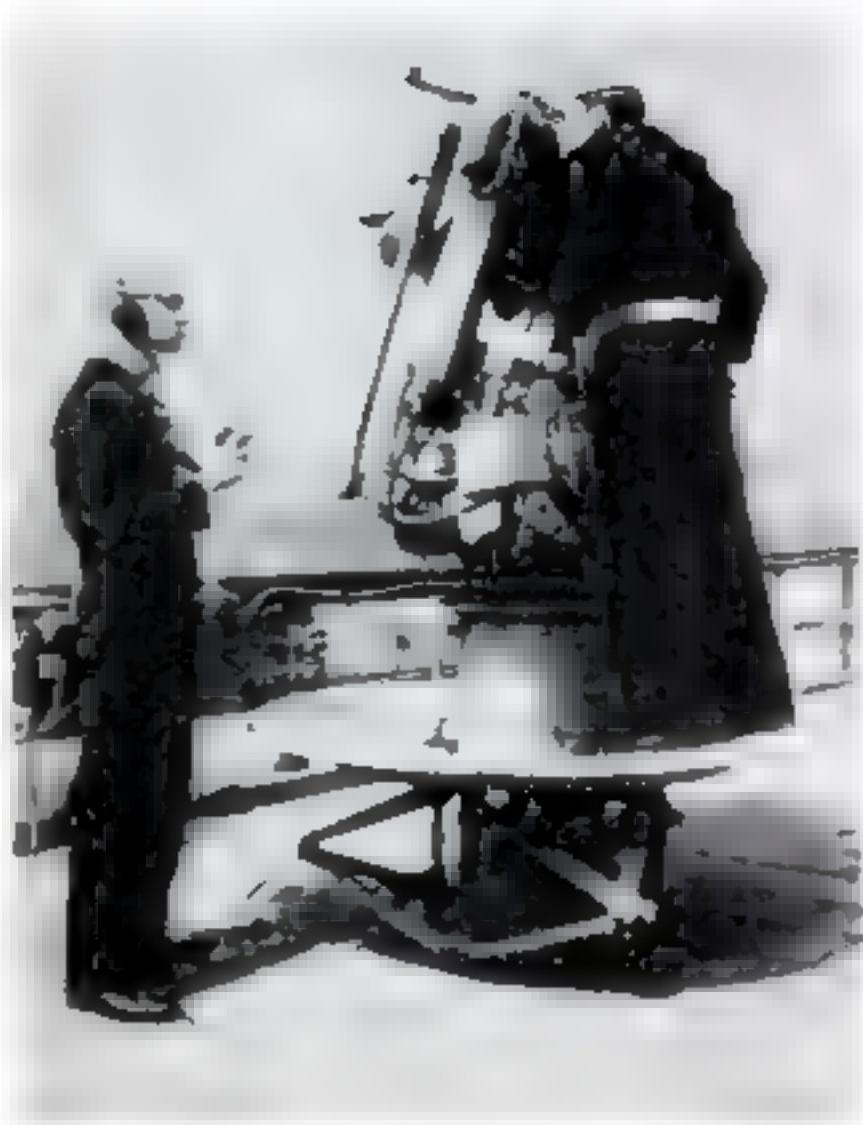
GOLDEN HAWK
SKY HAWK
POWER HAWK
FLIGHT HAWK

Studebaker Division, Studebaker-Packard Corporation—Where pride of workmanship still comes first!



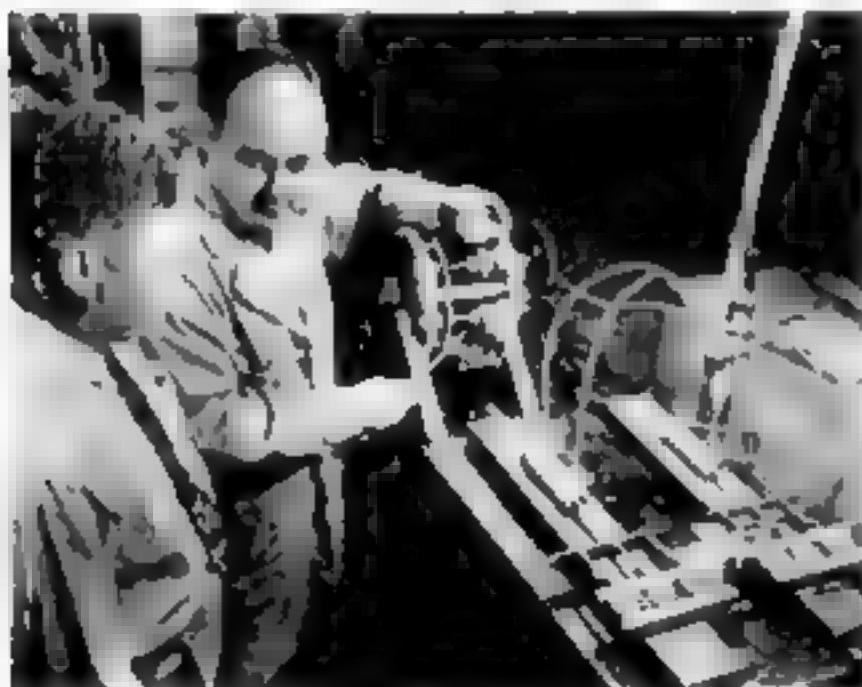
Sign Helps Drivers Avoid Stops

EVER drive along one of those staggered-light roads and hit them all red? Not in Dusseldorf, Germany. The electric sign above is synchronized with the lights, whose timing is varied with traffic conditions. It tells drivers how fast to go in order to find them all green.



Gun Control Tracks Speedy Jets

THREE-INCH and five-inch U.S. Navy guns can pinpoint supersonic targets in any weather with this new Sperry Mark 63 gunfire control. It combines gyro-optic tracking with radar ranging and high-speed computation. The "talker" at left maintains gun-crew contact.



Machine Wears Out Padlocks

LOCK pickers may find their job tougher as the result of research with this machine, which puts 20 years' wear on combination-type padlocks in 24 hours. The Armour Research Foundation, which developed the device, hopes that it will help in the design of stronger locks.



Jeep Cleans Streets in a Jiffy

RUBBISH, from matchsticks to tin cans, is gulped up by a six-inch suction hose on this converted jeep Gutter-Vac. It does the clean-up job on Washington, D.C., streets six times faster than a man. A unit mounted at the rear chews up the rubbish and blows it into a burlap sack.



\$239 delivered (new blade and 3 1/2 hp. motor included). EASY BUDGET TERMS



New 3 1/2 hp. direct-drive, custom-built motor. Rugged, reserve power for the toughest jobs — staying power for steady use.



Easy, safe, top-side cutting. Always see your work and your cut — never work "blind." Saw moves above the work.



Straight-line material handling. Arm swings 360°. Motor rotates 360°. Tilts past 90°. Material always moves straight on level table.



No floor space needed. Built into work bench, arm swings clear of work area — swings back when needed.



Exclusive New Shaper-Jointer Fence. Converts saw to a 27 jointer or V-cut. Positions work for accuracy, safety.



Exclusive New Shaper Guard. A DeWalt "first" safety accessory. Totally encloses knives and spindle — raises for adjusting work.

Complete versatility. Simply change tool on motor shaft. Your AMF DeWalt saws, dadoes, shapes, sands, bores, routes, surfaces, joints. If cuts, grinds, turns, cuts curves — does everything in woodworking.

New safety. New safety key switch — one of many DeWalt home safety features — turns power on or off. Take key with you and your family is completely protected.

SEND COUPON TODAY!

New 1956 AMF DeWalt "Power Shop" makes all home woodworking easy!

Here, in one big-capacity machine, is a complete home workshop... that gives you...

- The power you need for any operation
- 3-D versatility to handle any home project
- The professional accuracy to do any job quickly, easily, expertly
- The built-in safety you want in your home

See a demonstration of the new 1956 AMF DeWalt Power Shop at your dealer's today. Now more than ever, it's the finest, safest, most complete home workshop you can buy.



AMF DeWalt, Dept. PS-56-3, Lancaster, Pa.
In Canada: DeWalt Canada, Ltd., Guelph, Ontario

- Please send me free Colorful 20-page Booklet on how to do everything in woodworking... easily.
- Please send me free plans on how to build a home workbench.

Name _____

Address _____

City _____ State _____ Zip _____



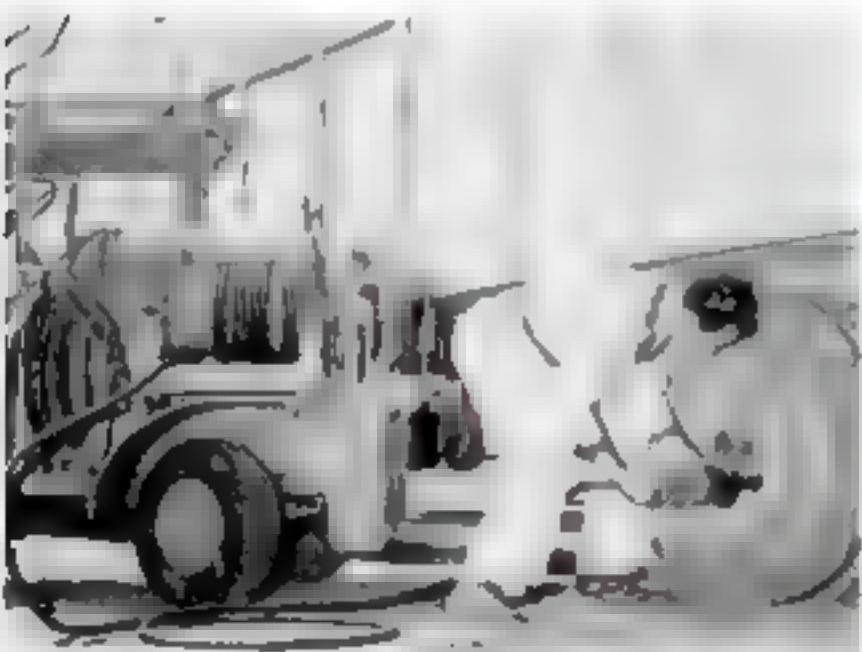
"Musical Chair" Plays Records

Two speakers in the wings of the armchair above provide recorded music for the seated young lady. The sound is limited: clear to the sitter, not heard a few feet away. The Teletunken Company, West Germany, developed the chair to replace booths in its record shop; found it popular. Now the company builds it to sell for use in the home.



He Wears Extra Eyes on His Hat

A SMALL 20-ounce detector on this ground observer's helmet gives him the position of an invisible plane at night or in fog. The experimental unit, built by the Air Research and Development Command at Rome, N.Y., picks up radar waves from an enemy bomber and converts them to a sound signal. The observer controls volume with a lapel knob.



Trailer Doctor Makes a Call

THIS shop on wheels packs a compressor, air and grease tanks, tires, ladder and pneumatic tools for servicing trailer trucks of the Pacific Intermountain Express Co., Oakland, Calif. Now the "yard doctor" works on trucks during loading and makes routine repairs that formerly took time in the shop.



IMP Tests Soldier's Ingenuity

DESIGNED to determine the energy used up by British Army recruits in basic training, this gas-mask-like device also tests the ingenuity of the Tommy above at tea time. The IMP (integrating motor pneumotachograph) collects and analyzes samples of exhaled breath, provides training and diet guidance.

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Our tremendous buying power and large volume enables us to pass important savings on to you in the form of rock bottom prices. Saving total up to 50%. We stock over 50,000 items—anything you need in the automotive line you'll find listed in the new Whitney catalog, ready for immediate shipment. Your complete satisfaction guaranteed on every order or your money back. Rush coupon for your FREE copy of the new Whitney catalog today. Please enclose 25¢ to help pay part of handling and mailing costs (refunded on your first \$5.00 order). Send for yours now.

J. C. WHITNEY & CO. 1917-1923 Archer Ave., Chicago 16, Ill.

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J. C. WHITNEY & CO.

1917-1923 Archer Ave., Chicago 16, Ill.

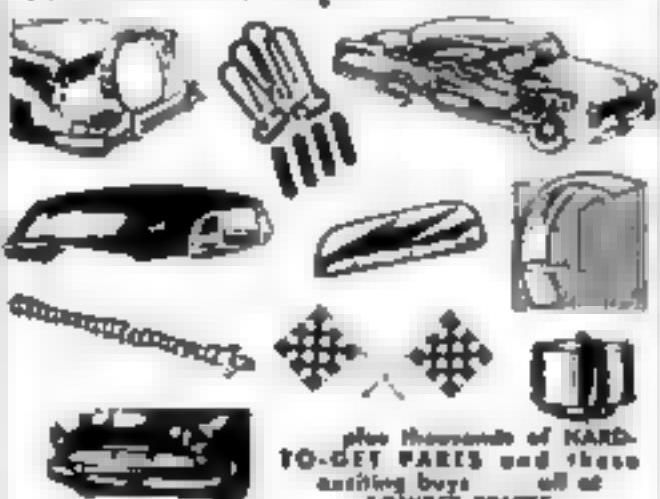
Please rush your giant 164-page 1956 Catalog describing world's most complete line of auto parts and accessories—over 50,000 items of lowest price. (Please enclose 25¢ to cover part of cost, which will be credited to you on first \$5.00 order.)

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Here are just a few of the 50,000 items in world's most complete automotive line:



plus thousands of HARD-TO-GET PARTS and these exciting buys—all at LOWEST PRICES

- Highspeed equipment
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- Engines and parts
- Auto Bodies
- Transmissions and parts
- Custom-Styling Accessories
- Tools
- Radiators
- Springs and Shocks
- Ignition parts

REYNOLDS endorses NICHOLSON FILES for “Do-It-Yourself”* ALUMINUM



It's quick and easy to make things from aluminum with ordinary home tools when you use Reynolds "Do-It-Yourself" Aluminum. For most projects, you need only hammer, saw, shears and file.

The file is very important for removing rough edges which are formed when aluminum, like any metal, is cut or sawed. Some files do the job better than others, Reynolds has found. And the best files for the job are made by Nicholson.

For best results, ask your hardwareman for Nicholson files when you buy Reynolds Aluminum.

Nicholson 8" Handy File: double-cut side for fast metal removal; single-cut side for finishing. Ideal for aluminum and for wood, metal, plastic. **Not shown: 6" Half Round File,** for removing burs inside aluminum tubing after cutting.

Reynolds products and Nicholson-made Black Diamond files are also available in Canada



NICHOLSON FILE COMPANY
Providence, R. I.

NICHOLSON FILES

A FILE FOR EVERY PURPOSE

*T. M. Reynolds Metal Co.

Comic Strip Reports Aviation News [Continued from page 170]

versity of Texas for three. In his dry way he says, "I was an impossible student. My first midterm at Texas I got two E's and two F's."

He lasted for 2½ years more, but only with some enforced time out, during which he studied briefly at the Chicago Academy of Fine Arts and took a \$28 correspondence course in drawing.

Having always wanted to travel, Roy took advantage of his freedom, when finally bounced from college, to start riding the rods around the country. The 1922 railroad strike soon made that pretty tough, as the companies sent detectives out on their freights. Finding himself in Galveston, Roy shipped out as a seaman on a freighter. After a trip to Europe, he landed in New York.

First strips. There he looked for a shore job as an artist and got one in the advertising department of the New York *World* at \$12 a week. Soon he was looking around for ways to make more money, and he tried his hand at a daily cartoon panel. The syndicate he approached managed to sell it to only two newspapers at \$1 a week apiece. Next he submitted his drawings to the Newspaper Enterprise Association in Cleveland. After several months, NEA offered Roy \$50 a week to draw a daily strip.

That was in 1924, when comic strips were mostly gags, complete in a single day. All the cartoonists subscribed to humor magazines, and put their own twists on the jokes.

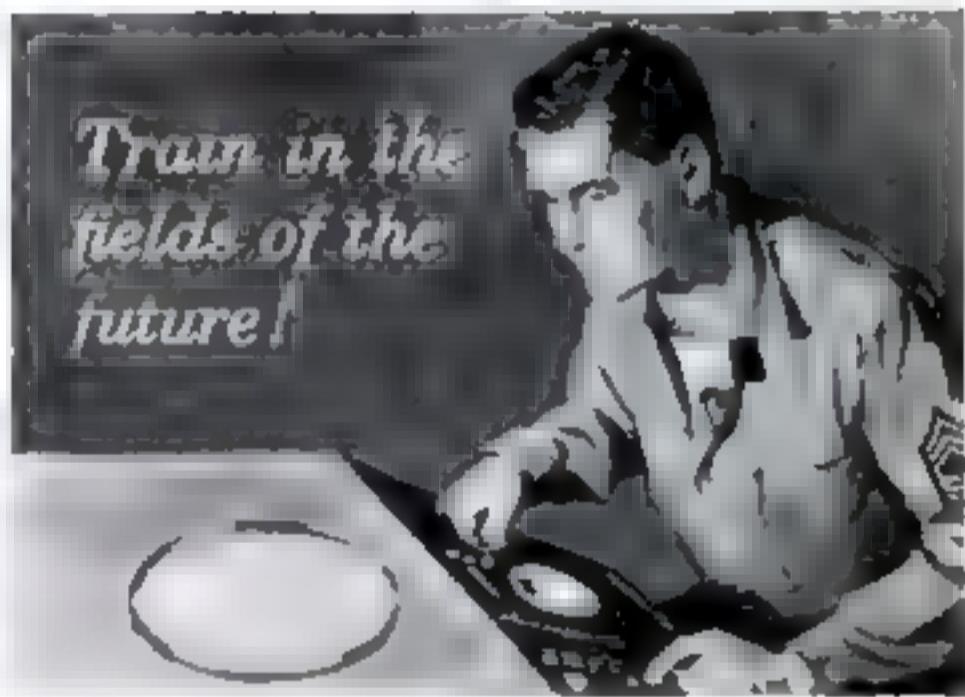
But Roy just couldn't think up gags. He spent hours at his drawing board listening to the trains one block away and the whistles from the ships in the harbor. The sounds got into his blood and he thought of shipping out. Finally he abandoned gags for adventuring—on paper.

A pal for Wash. With Wash Tubbs, a young man about his own age and billed as the hero of his strip, he roamed the world, pioneering adventure cartooning. Flying was not part of his material in those days. It came in later when Crane

[Continued on page 260]



Enlist for Electronics...GUIDED MISSILES



RIght now, you can take a giant step into the future with specialized Army training in electronics and guided missiles. Enter these wide open fields now, and prepare for the Space Age! Develop invaluable skills—already in great demand both in military and civilian life!

Training money can't buy—Here is training money can't buy! Instruction and equipment so advanced they are not yet available in most civilian courses. That's because the Army has pioneered the development of guided missiles and electronics for national defense. You benefit from this leadership with training designed to make you tops in your field.

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New command—new opportunity—You'll take this training in the Army's latest, most modern command—the "command of the future"—the Army Antiaircraft Command. This is a young elite organization specializing in new supersonic weapons, and offering unlimited opportunities for advancement. Join these key men in America's future! To get in on the ground floor, apply now!

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Please send me further information on my opportunities in the new Antiaircraft Command

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City _____

State _____

Comic Strip Reports Aviation News
[Continued from page 28]

was having trouble getting Wash out of scrapes because he was too small to fight. Roy's brother-in-law suggested that he introduce another character to help Wash fight. The result was Captain Easy, after whom that strip is now named.

In 1943, when Wash Tubbs and Captain Easy were riding the crest of the wave, Roy Crane left NEA, which owned the strip, to start a new one which he would own and sell through King Features, in New York. He decided to put the hero in the Navy because there were no other Naval aviation strips going. Before he began, he spent months planning and trying to do research, which, in the middle of the war, was not always easy.

Deadlines and ulcers. The manager of the syndicate he serves says that he has never known an artist who worked harder than Roy Crane. For years, Crane did all his own research and writing, and drew six daily strips and a Sunday color page all by himself. He finally de-

veloped ulcers. Now he has one full-time and two part time assistants and is trying to take it easier and do more traveling.

Married for 27 years, Roy has two daughters. He modeled Buz Sawyer's sister after Nancy, the older one, who is married and has a four-year-old son. Cristy, Buz's wife, was modeled after Marcia, his younger daughter, who is single and was Miss Florida in 1952.

Crane's only hobby, besides traveling, is work. Even on trips, he loves to talk shop, sometimes until three or four in the morning. He gets his greatest kicks today from the acceptance of his strip by fliers, especially Navy men. Once a Navy pilot asked him if he had been a Navy pilot, too.

"When someone says something like that to me," he says, "I feel warm for a good time afterward." **END**

NEXT MONTH: Popular Science Monthly will introduce you to the man who wants to change your typewriter keyboard.

IT SMELLS GRAND



FRESH AND FRAGRANT AS A
NORTH WOODS BREEZE

IT PACKS RIGHT



CUT JUST RIGHT TO PACK WITH Ease

IT SMOKE SWEET



COOL AND SMOOTH—IT'S SURE TO PLEASE

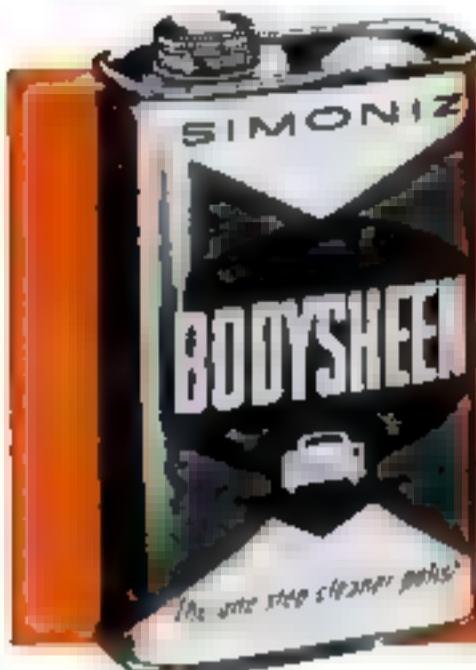
IT CAN'T BITE!

SIR WALTER RALEIGH'S BLEND OF CHOICE
KENTUCKY BURLEYS IS EXTRA-AGED
TO GUARD AGAINST TONGUE BITE.



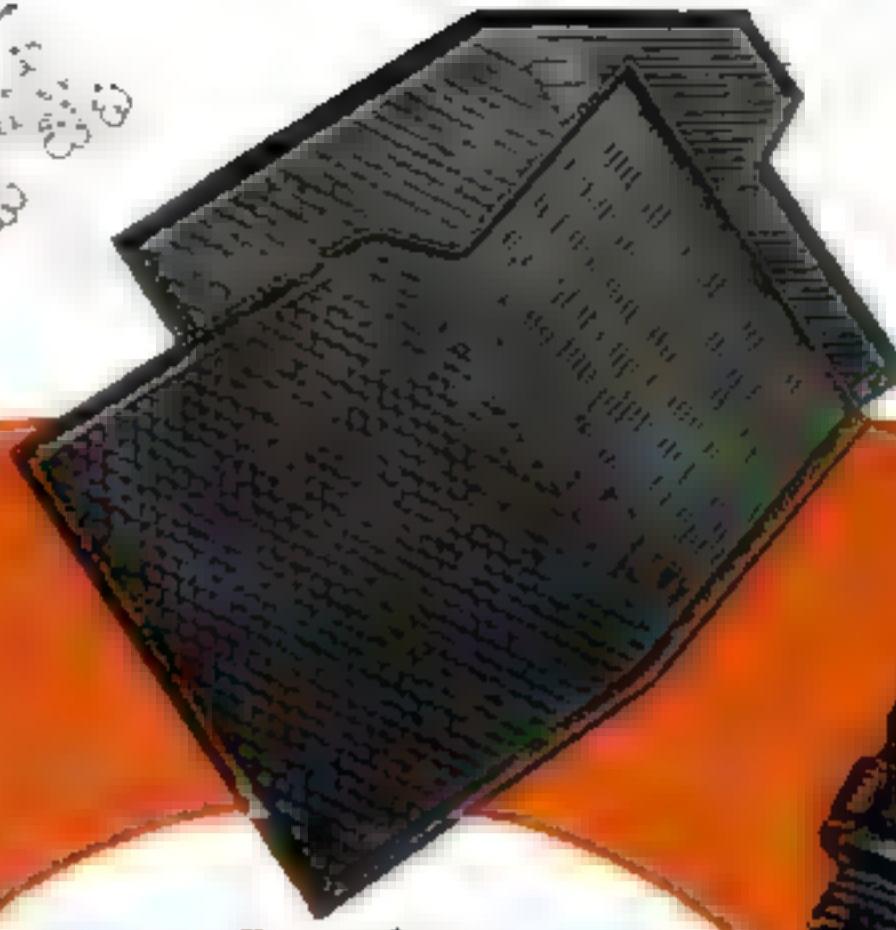
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Just wipe on new Simoniz Bodysheen, then wipe it off to give your car a tough, long-lasting, weather-resistant finish. No more hard rubbing! Brings out natural brilliance, enriches colors! 16 oz. \$1.49



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and help keep trade-in value high with these twin Floor Mats. Cover entire front area, flat and slope. Designed to stay in place. Fit all cars. All new rubber. Black, red, blue, green, yellow. each From \$3.59

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Portable Spotlight plugs into lighter socket... perfect for night repairs, finding house numbers, etc. Powerful 4½" sealed beam unit. All chrome finish. On-off switch. 10-ft. cord. 6 volt each \$5.85
12 volt each \$5.75

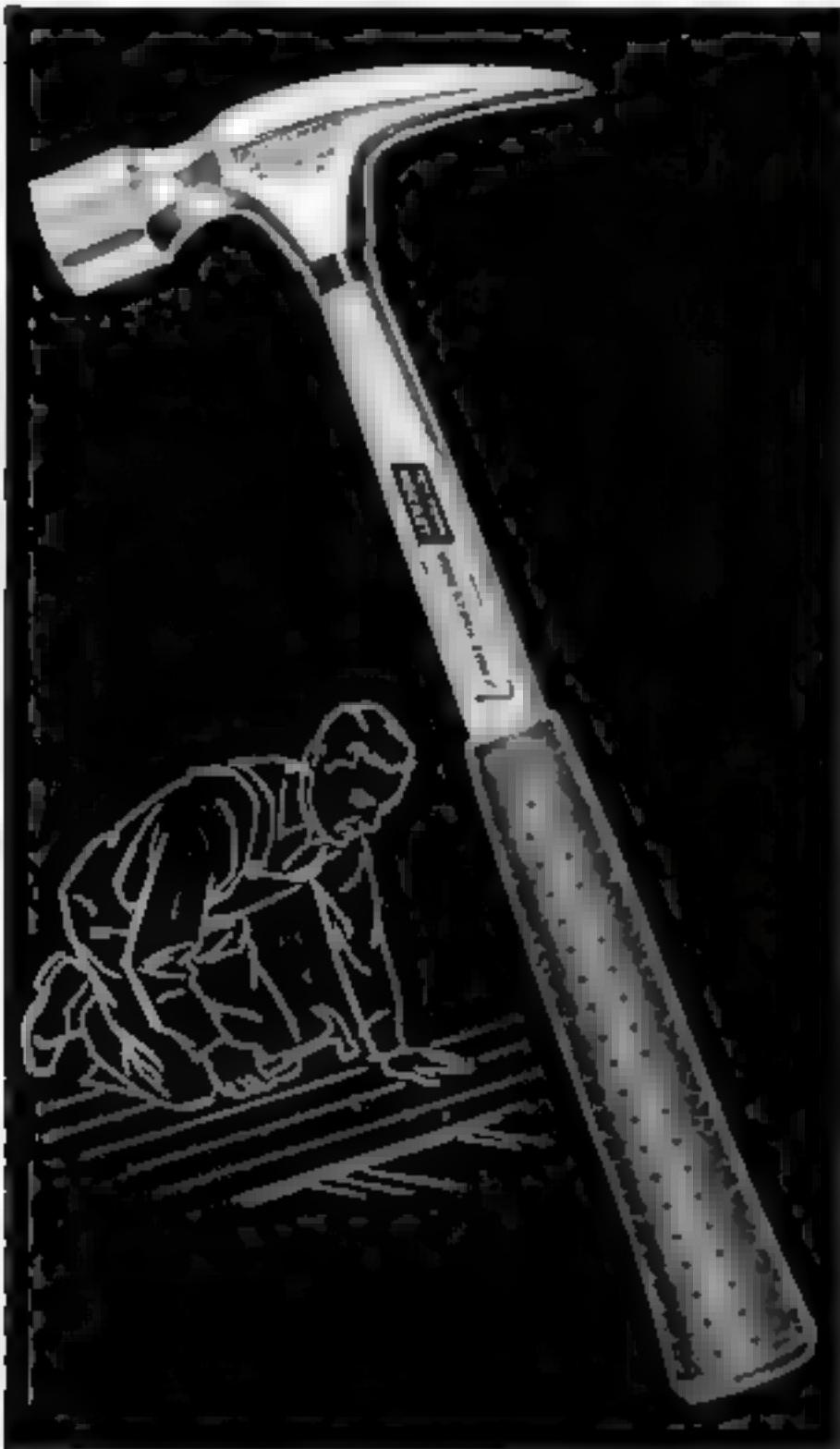
Guaranteed leakproof,
blowout-proof. Wizard Muffler protects against carbon monoxide gas fumes... gives "new car" silence to old engines. Original equipment specifications. Heavy, long-lasting steel. each From \$4.95



Wizard Tune-Up Kit makes it easy to "tune" ignition system. Complete kit with heavy duty points, condenser, rotor. Saves gas, makes car start easier, run smoother, perform better. Easy instructions. All popular cars. each From \$1.05

NOTE: In some areas of the U.S., Hawaii, Alaska, and Mexico, prices slightly higher. Western Auto Associate Dealers own their stores, set their own prices, terms and conditions. (PS36)

TRUE TEMPER Tool News



WORLD'S TOUGHEST HAMMER

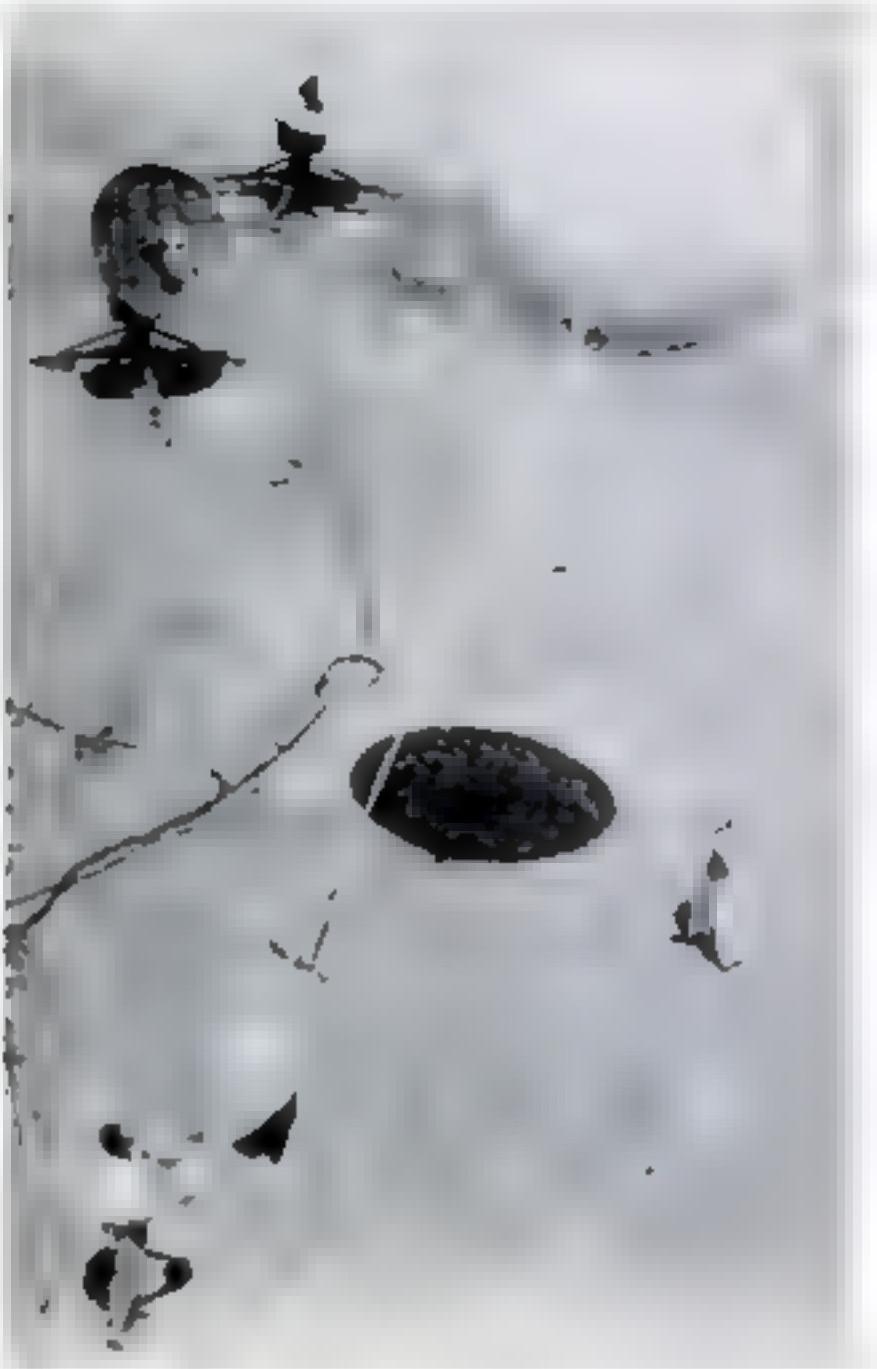
Now you can get a heavy-duty 20-oz. ripper in the famous ROCKET model. It's a brute-strength tool—the most rugged hammer ever made. The tubular steel shaft won't bend or break. The head, locked to the shaft, can't loosen. It's the perfect hammer for electricians, plumbers and for all heavy-duty work—crating, flooring, framing, concrete forms, etc.

The nonslip cushion grip absorbs shock. This is the sweetest feeling hammer you ever swung. See all the ROCKETS—and True Temper's fine wood-handled hammers, too. True Temper Corp., Cleveland 15, Ohio.



TRUE TEMPER.

Fine quality in hammers, hatchets, axes • Garden, lawn and farm tools • Shovels • Shears • Fishing tackle • Golf-club shafts



Balloon Speeds Weather Data

CLIMBING at 1,800 feet a minute, this neoprene balloon developed by the Army Signal Corps rises twice as fast as the old "weather sack." Data gathered by radiosonde (foreground) is picked up by ground receivers (rear) and transmitted to a central station.



Machine Types in 50 Languages

BY CHANGING type plates, this machine's operator can type messages in 50 languages—without understanding them. She uses a transcribing code that matches numbers on the keys. The machine was developed for U.S. Army psychological warfare in the field.

**Famous Antique Shop
uses and recommends
Klean-Strip Paint Remover**

KLEAN-STRIP, the non-inflammable paint remover, is used exclusively by Leonard's Antiques, Seekonk, Mass., to restore the beauty of wood heavily coated with paint and varnish. L. C. Leonard reports "KLEAN-STRIP has far exceeded expectations . . . and exceeded results obtained with other removers used. We are sure it's the best."

KLEAN-STRIP works best for any refinishing job. It's fast-acting, easy to use, needs no neutralizing or afterwash. Buy it when and where you buy paint.



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KLEAN-STRIP
"PEELS OFF PAINT"**

HARNESS
YOUR
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Universal Motor Mount

for the home workshop!

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Attention . . . workshop fans and formal! It's brand new! The perfect method of mounting a motor and driven equipment. Easy to align pulleys and obtain correct belt tension in a jiffy!

It's sturdy, light-weight. Fits all motors up to 1 HP and small gas engines. Permits two-way movement of motor for use with sander, pump, compressor, generator, fan or other power driven appliances.

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All you do is staple it—or tack it—to your attic studding. Because aluminum reflects up to 95% of all radiant heat, this insulation keeps heat in, locks moisture out—saves dollars every month. (Attics are up to 16° cooler in summer, too.) Call Western

Union Operator No. 25 for the name of your nearest hardware or lumber dealer.



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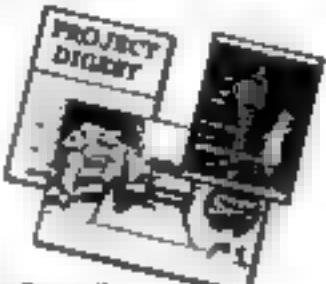


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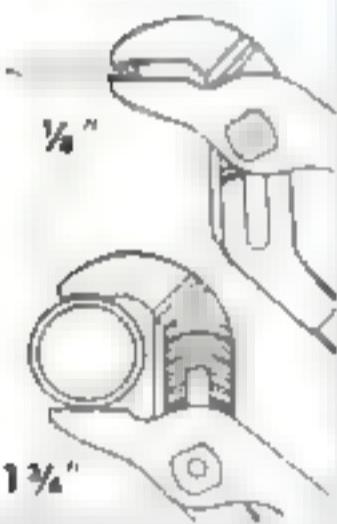


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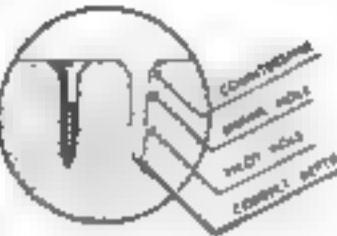
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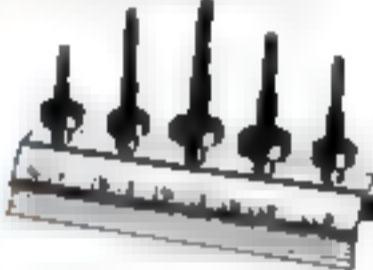
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Squeezing More Power from Coal

(Continued from page 162)

enough temperature and pressure, there comes a point when the steam produced becomes as dense as the original water. At this "critical" point, problems arise which were once thought to be insoluble.

No bubbles or boiling. This barrier will be broken by the Ohio and Philadelphia plants now under construction. These "supercritical" plants have no conventional boilers. Hot water passing through the pipes will suddenly become steam without bubbling, boiling or expanding. With steam at the record-breaking temperature of 1,200 degrees, at a pressure of 5,000 pounds per square inch, for which the new Philadelphia plant is designed, previously used metals would melt like ice in July. So superalloy stainless-steel pipes will carry the steam to the turbines.

Under the intense heat of the steam, the walls of these pipes, which are $2\frac{1}{2}$ inches thick, will glow cherry-red in operation. Pipes made of previous metals

would have needed walls 16 inches thick, say the Philadelphia engineers, and even then might not stand the strain.

Power for 3,000,000 consumers. To prevent corrosion of pipes at the high temperature, a special process reduces the mineral content of the water to less than one part in 20,000,000, which would amount to about a tablespoonful in a standard swimming pool. The plant will burn 100 tons of pulverized coal an hour and is designed to produce more power from its fuel than any plant in the world

Power engineers expect these new plants to act as bellwethers for further sensational cuts in fuel costs. "Just suppose we had rested on our 1925 laurels," says R.G. Rincliffe, president of the Philadelphia Electric Company. "Then it took two pounds of coal to make a kilowatt-hour. By 1965, to supply the expected demand for steam-electric power, we would be consuming coal at the astro-

(Continued on page 294)

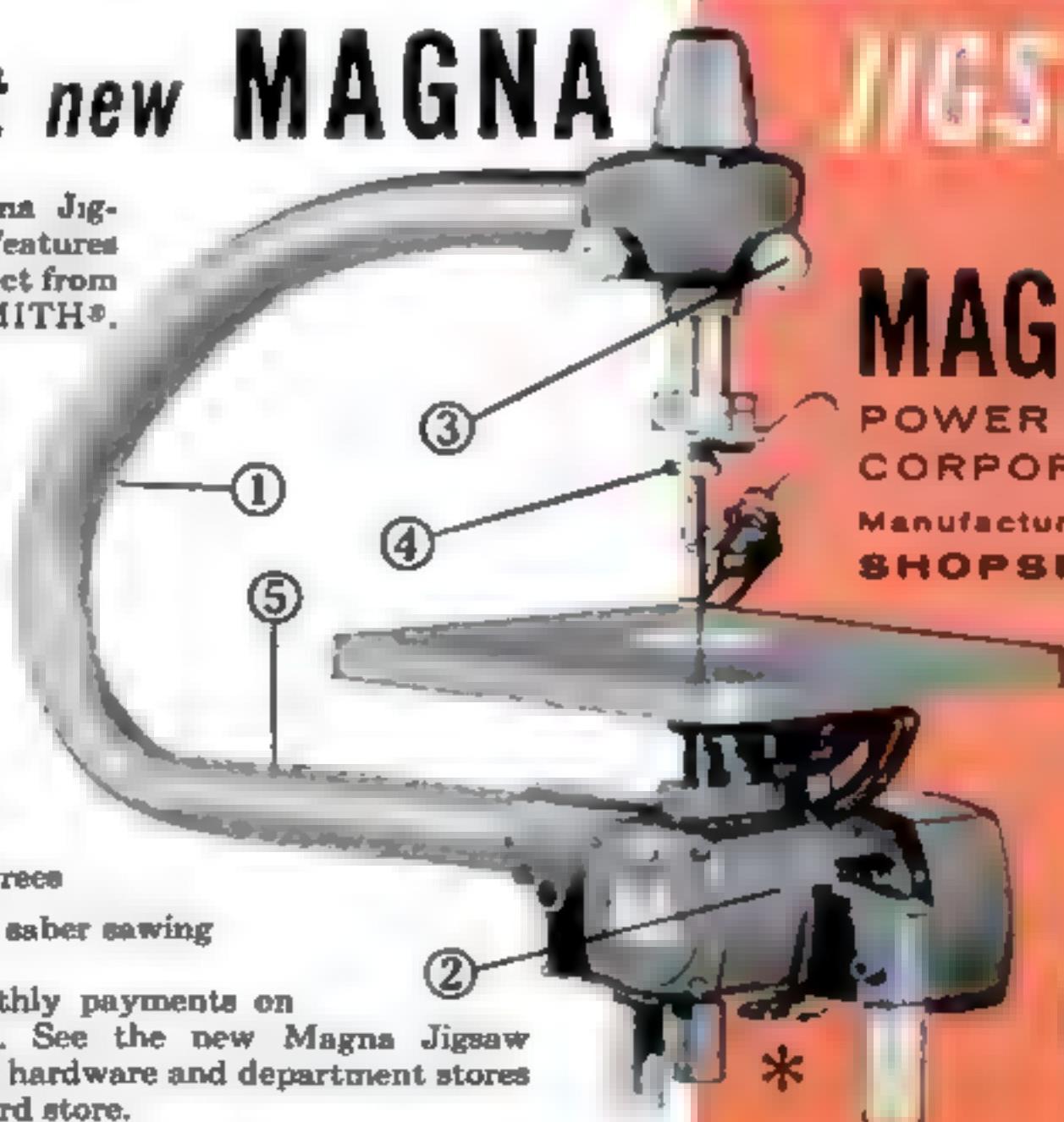
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It rips right through a rough 2 x 4... even at a 45° angle! That's something no other popular price saw will do. No need for second cuts as with smaller blades. AND... Only the NEW Fairchild Gives All These Quality Features—

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Blade visible from both sides.

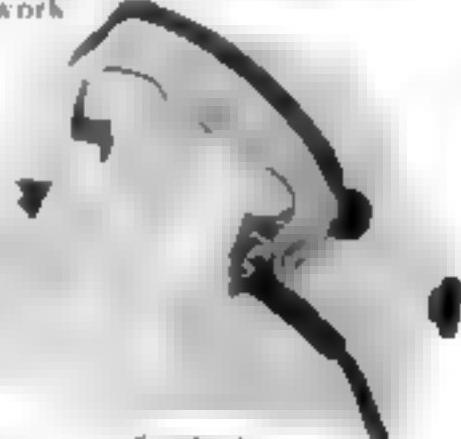
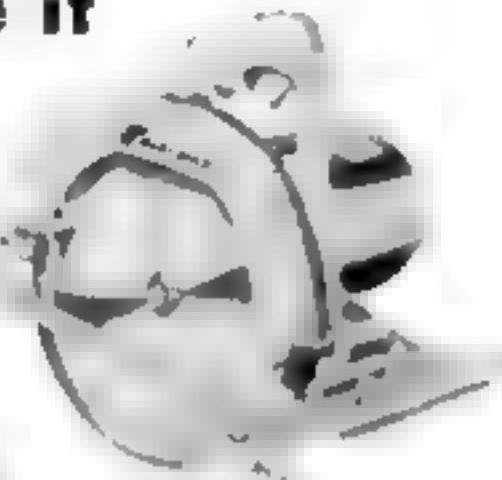
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Electrical Products Division

How to Keep Your Propeller Shipshape

[Continued from page 107]

different pitches, to guide you in experimenting with your prop.

What's the pitch? The pitch of a prop is the hydraulic equivalent of gear ratio. It is the axial distance that a propeller would travel in one revolution, assuming no slip. If for example you could take a prop having 10" pitch and screw it into a large hunk of cheese, it would, in one turn, enter the cheese 10".

Use the gauges by putting a prop on the checking fixture with the rear (pressure) side down. It should fit without shake on the center post. Spacers can be used to hold it any convenient distance above the plywood. Put each

.....
It's easy to get children to follow the straight and narrow path—all you have to do is live in a corner house and grow a nice lawn in front of it.

—THE SIDEWALK SUPERINTENDENT

.....
gauge on its proper diameter circle and move the blade face against the gauge edge when testing.

The curve of a blade may be changed by judicious use of a soft-faced hammer. Big changes (to be avoided as much as possible) can be managed with a lead hammer, working against a lead block as anvil. Go easy until you get the feel of the prop metal, and check repeatedly on the fixture. If you've had to reshape one blade considerably, relieve stresses in the prop by heating it in an oven for half an hour (350 degrees for aluminum or bronze, higher for steel). Don't heat a prop with a plastic sleeve in its hub.

Balancing. However skillfully pitched, an out-of-balance prop can shake your teeth loose. Test it either by setting the prop, placed on a snug-fitting shaft, on a pair of leveled knife edges; or by sliding the prop back and forth on a slightly looser shaft. Carefully file away metal from the heavy side. When a small paper clip attached to one blade will regularly make it drop, the propeller is pretty well balanced.

END



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NO MORE DIRT! NO MORE SWEEPING! DUSTMAN gathers up all wood dust, wood chips, or metal shavings as they're formed and discharges them into a waste can. Keeps your shop spotless, the air pure and dust-free. Attaches to saws, Sanders, multi-purpose tools, radial arms, portable tools.

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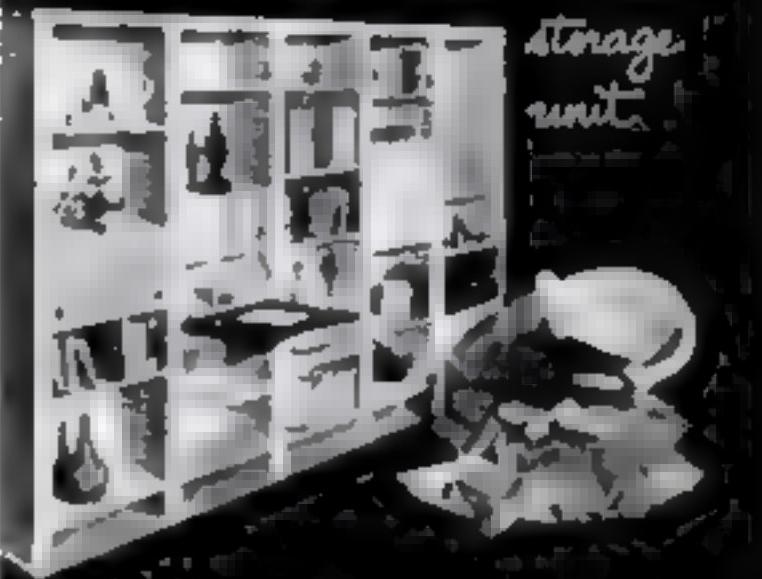
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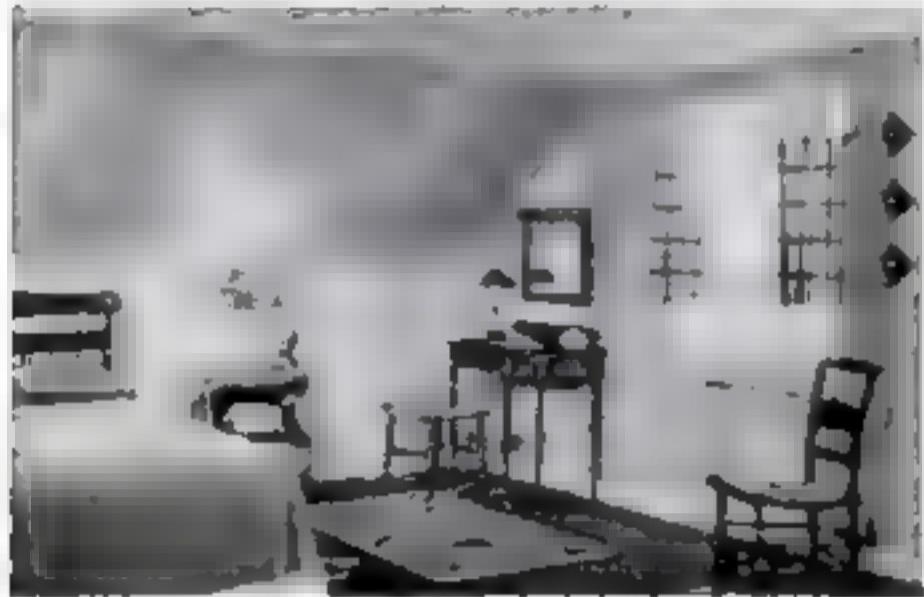


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You'll Soon Ride Two-Headed Trains

[Continued from page 126]

Taming the curves. If you're a rail fan, you will probably be puzzled by one thing: How can this train, for all its low-hung coaches, make any better time than ordinary New Haven flyers if you sandwich it between two locomotives that, in center of gravity, are no different from the ones used today?

Here's the answer:

Train schedules, now, are not limited by the safe operating speeds of conventional equipment. They are held at least 40 miles an hour below that limit, out of respect for your personal comfort. The limits are set not to keep the train on the rails but the coffee in your cup. Talgo coaches can eliminate practically all of these restrictions, because the lurching movement is changed into an easy pendulum action.

For present equipment, the New Haven has enough slow-order curves between Boston and New York to make seven complete circles. But riding in the new Talgo, at higher speeds, a passenger will seldom even know when the train is going around a curve. **END**

New System Films, Files, Finds



A 60-to-1 reduction squeezes 12 pages of information—and a complete filing code—onto this single Kodak "Minicard." To store or search out filmed information, the filing system's photoelectric eyes can scan codes on 1,800 cards a minute.

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- KIMSUL Insulation is designed to cut winter fuel bills up to 33%—to keep your house up to 20° cooler in summer.

- And KIMSUL is clean—free of irritating dust and slivers.
- So light and compact even a woman can carry a 200 ft. roll—or take home enough in the car to insulate an entire attic.

At your Kimsul lumber dealer's—this denim cobbler's apron. Regular \$2.50 value—only 89¢

Perfect for hobby work, gardening, barbecuing. Has three large pockets, adjustable waist and neck bands. Only at your KIMSUL lumber dealer's and only for a limited time.



KIMSUL
INSULATION

Kimberly-Clark Corporation • Neenah, Wisconsin

The Four Ways to Remove Paint

[Continued from page 223]

try another trick. Spray it on instead, using a hand-operated insect sprayer—Flit gun. But first slap newspapers over anything around that needs protection.

Give the remover time to work. A typical paste remover needs at least five minutes on lacquer, varnish, or shellac; and anywhere from 20 minutes to several hours on most kinds of paint.

Test the result with a putty knife. If the entire finish, no matter how many coats, will not come off at one time, stop. Wait a while and try again. If necessary, put on another coat of remover. Apply it in the same manner.

When the old finish wrinkles and lifts easily, take it off with a putty knife, followed by steel wool. Go after crevices and curves with steel wool or a wire brush. Tough places in furniture legs and other turnings can sometimes be reached best with strands of twine or burlap. You can make scrapers to fit moldings by clipping them out of light sheet metal.

Those are the standard procedures. When they don't work well enough, try some tricks: soak up messy jobs by sprinkling on coarse sawdust; even set fire to a final coat or remover. (But do this only if you're working outdoors, have taken proper precautions, and are covering only a square foot or so of surface at a time.)

If you're taking finish off a really fine piece of furniture, you may want to skip the putty-knife job entirely to avoid possible gouging. Wipe with burlap instead.

Always use solvents. Do you need to wipe the surface with solvent after the old finish is gone? Most labels say no. Most experts say it's a good idea no matter what the label says.

There's a new and important factor today that makes the solvent wipe more important than it used to be. This is silicone furniture polish. If there is any likelihood that the piece you are refinishing has been polished with a silicone, give it a really thorough cleaning—particularly if you are going to lacquer it.

[Continued on page 274]

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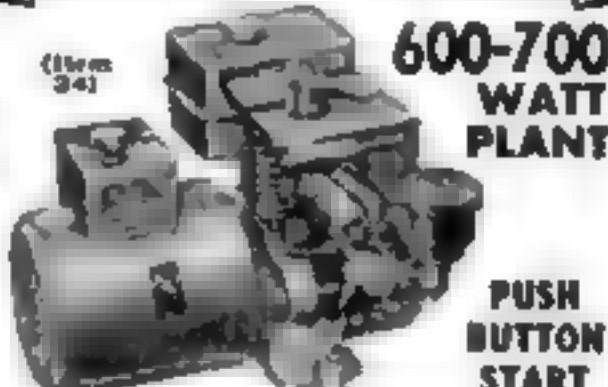
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110 v. 60 cyc. AC Powered by a rugged 2 HP. easy starting Briggs engine. No wiring necessary just plug in and operate. 100% of current for any job. Burner. If ever. Incandescent, emergency lights, etc. which require up to 700 watts. Ideal for television and radio. Complete with voltmeter and built-in winding to charge 6 v. auto battery. Item 24. Wt. 75 lbs. Easy to take in car trunk. Be prepared if storm comes out power lines. \$143.50

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110v. 60 cyc. AC Push Button Start. Powered by a 3 1/2 HP. Briggs engine. Combined big output with easy push button. Includes emergency power for operating any oil burner, pump, pump, fire-extinguisher, lights, communications system, etc. which require up to 1500 watts. Item 24. Wt. 110 lbs. Reg. \$175 value. Factory price \$239.50

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Dual Voltage 110/220 available for above. 120 v. 60 cyc. 1000 watt output. We make every type and size of light plants — Write giving all your requirements.

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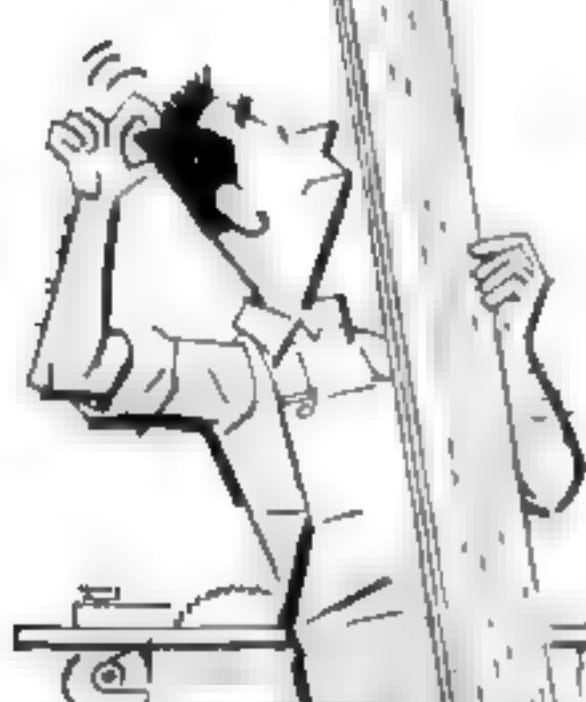
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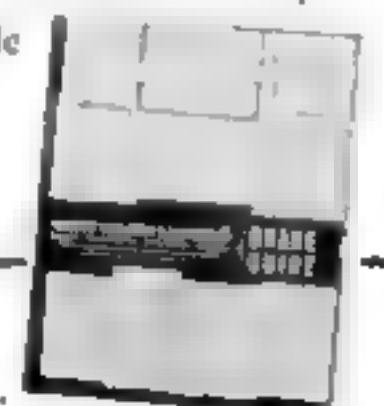
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The Ridge Tool Company, Elyria, Ohio, U.S.A.

The Four Ways to Remove Paint

[Continued from page 272]

Otherwise you're asking for those nasty blemishes that the pros call craters or fisheyes.

The wipe can be with any common solvent. Alcohol, turpentine and lacquer thinners are okay. If you have reason to suspect silicones, make it at least two wipes, each with a clean cloth. If there are deep gouges or burns in the surface, enough silicone or even wax polish may have penetrated to make trouble. Blot it out by poulticing the area with a paste of fuller's earth or clay wet with turpentine. Let it dry, remove it, then blow it out thoroughly.

And remember that even the dust from sanding is a potential menace to a lacquer job if a silicone is around.

Dodging the issue. Not one of the methods of depainting is either easy or fun, so it's worthwhile to sneak out of the job if you can. Sometimes you can.

If the surface is to be repainted and is in good condition, you can use one of the cleaning and de-slicking liquids instead of taking off all—or any—of the old paint. About all you have to do is wet a rag with the fluid and wipe the surface. This takes off wax, grease and dirt; it also softens the old finish just enough to give it a tacky surface that new paint will cling to without creeping.

Another advantage of this system over sanding is that it gets to the difficult places, such as grooves in moldings, that are mean to reach with sandpaper. If the old paint has been heavily waxed, use (instead of a rag) 00 steel wool dipped in the fluid.

END

Collector's Item

The collection department of a Chicago firm tried a new method on a slow-paying account in a small town.

"Dear Mr. Smith," the letter began, "what would all of your neighbors think if we came to your town and repossessed your car?"

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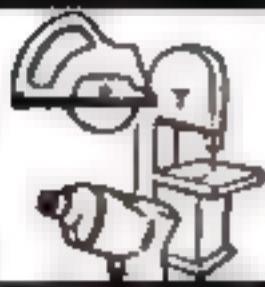
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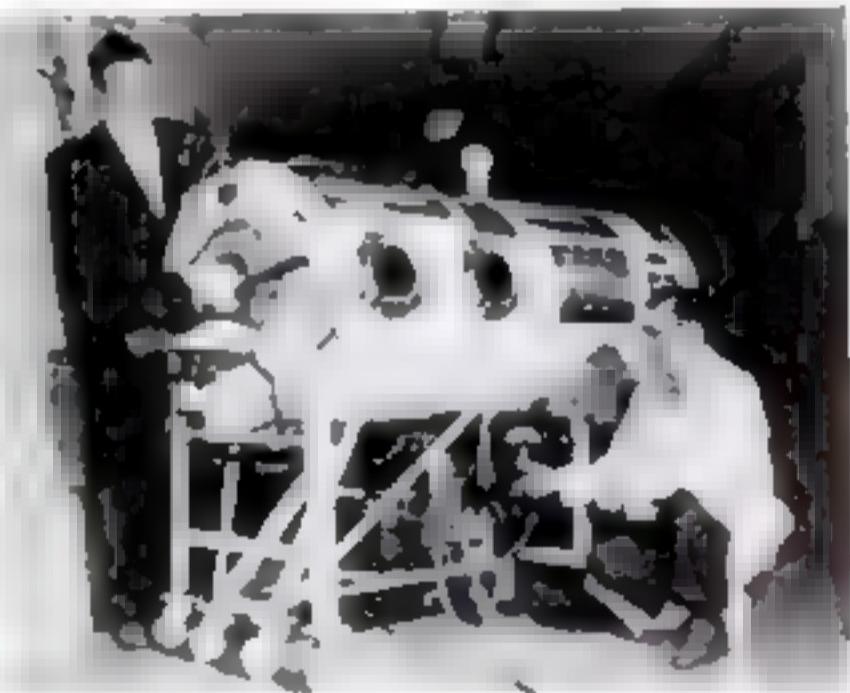
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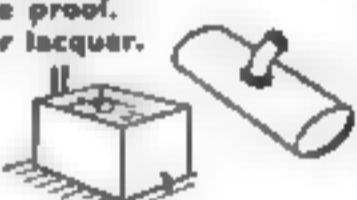
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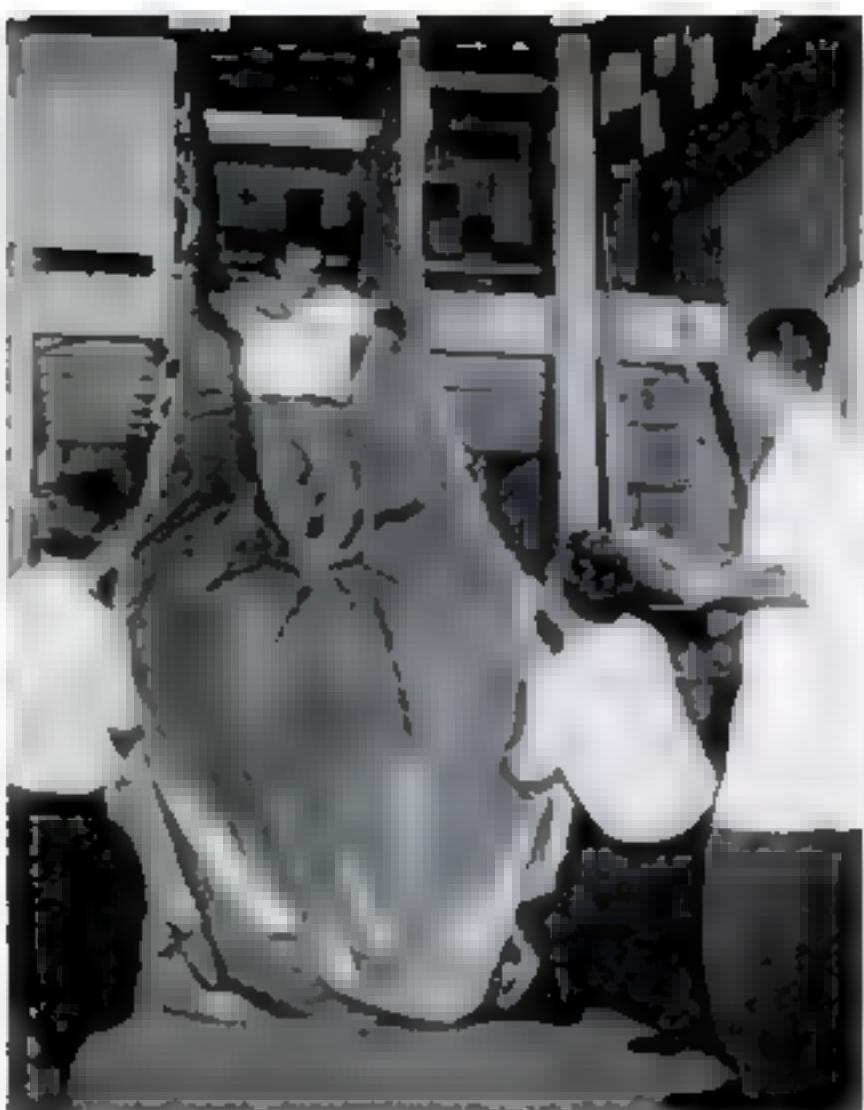
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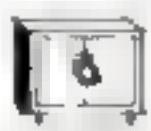
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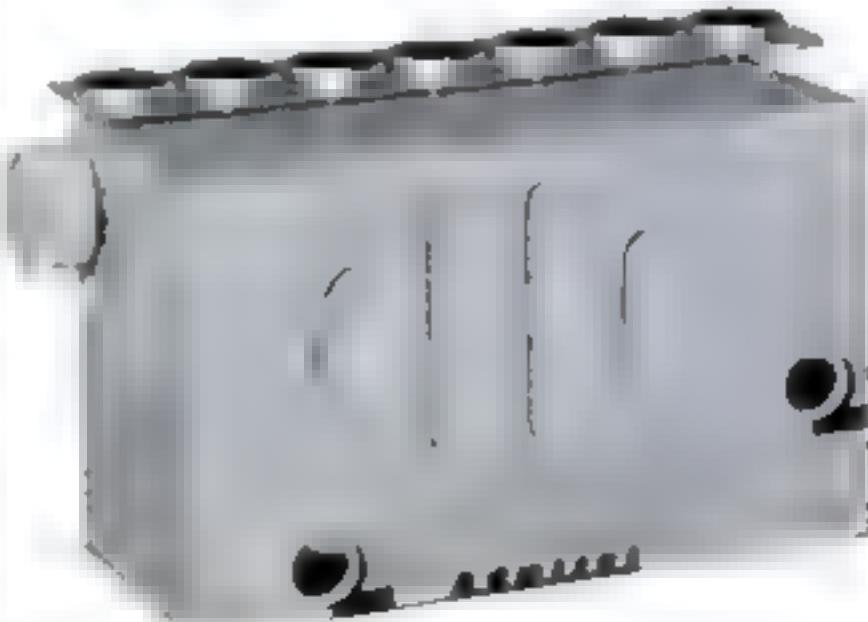
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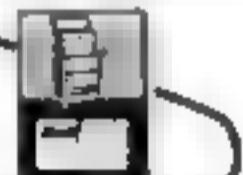
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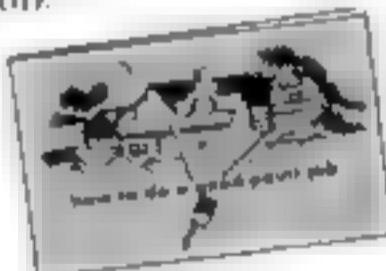
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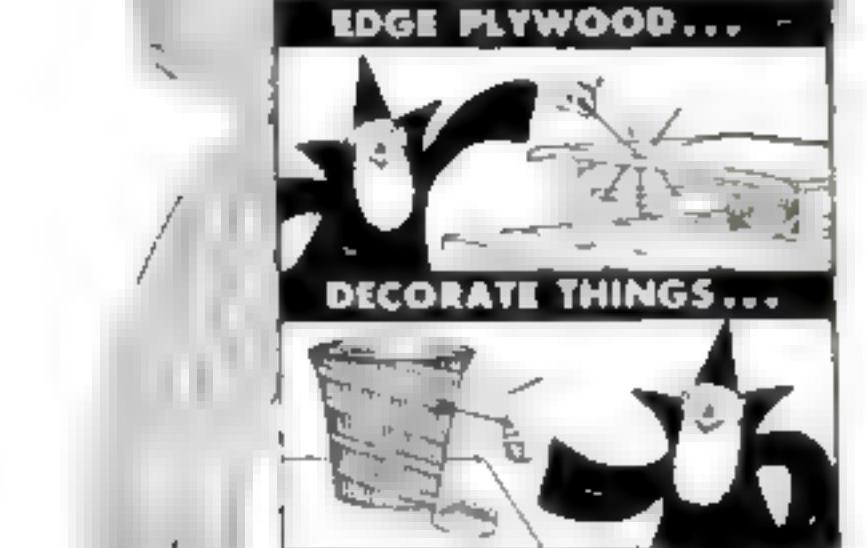
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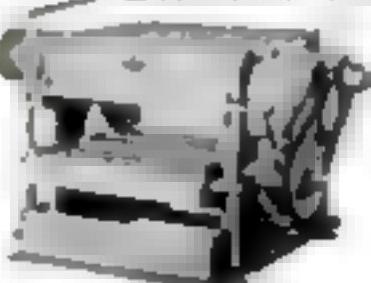
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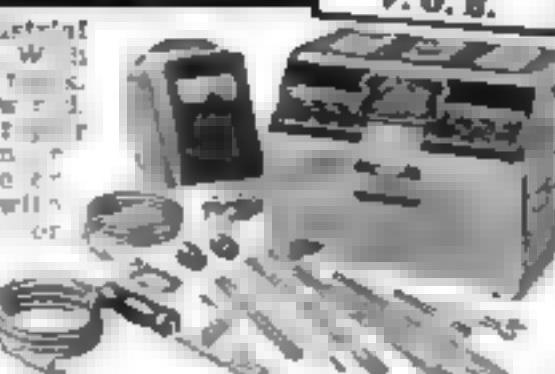
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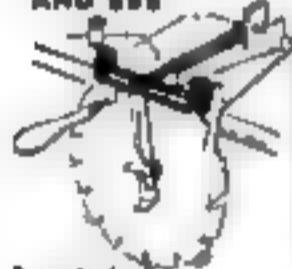
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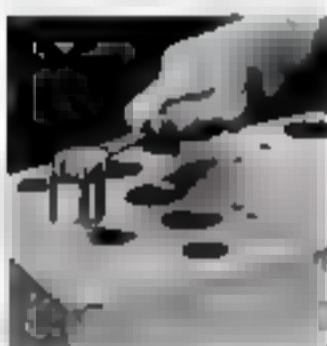
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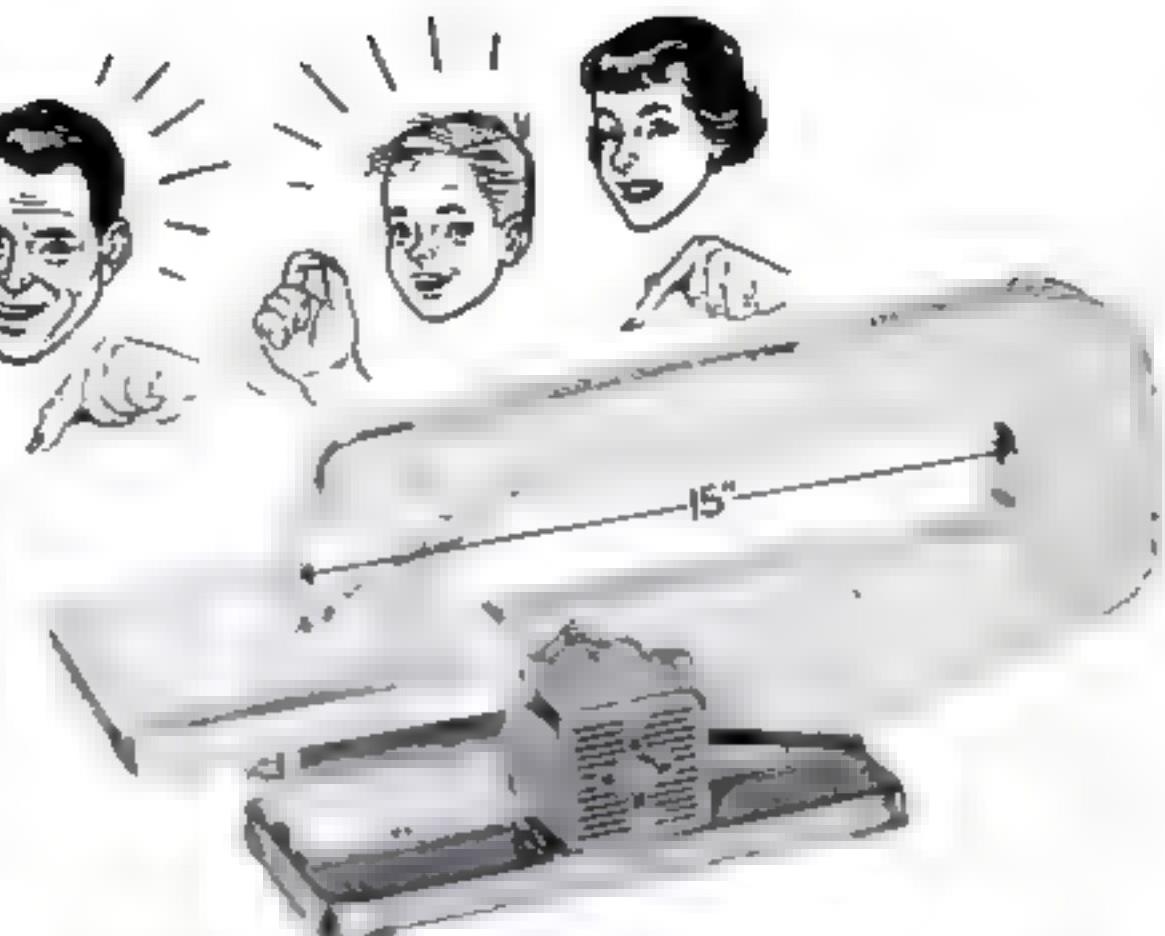
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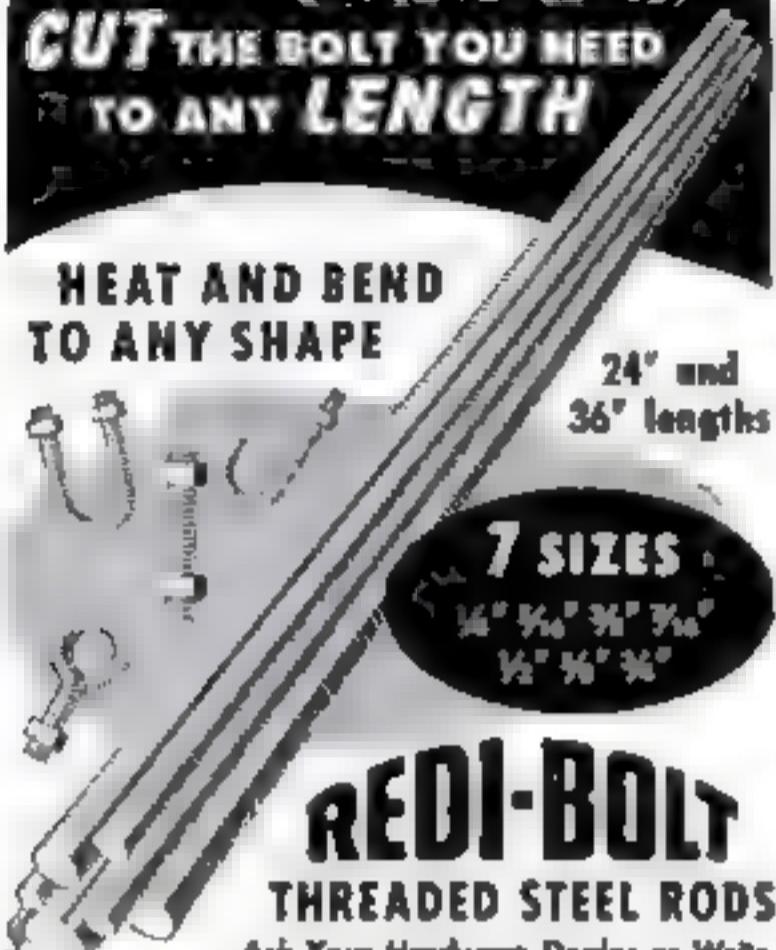
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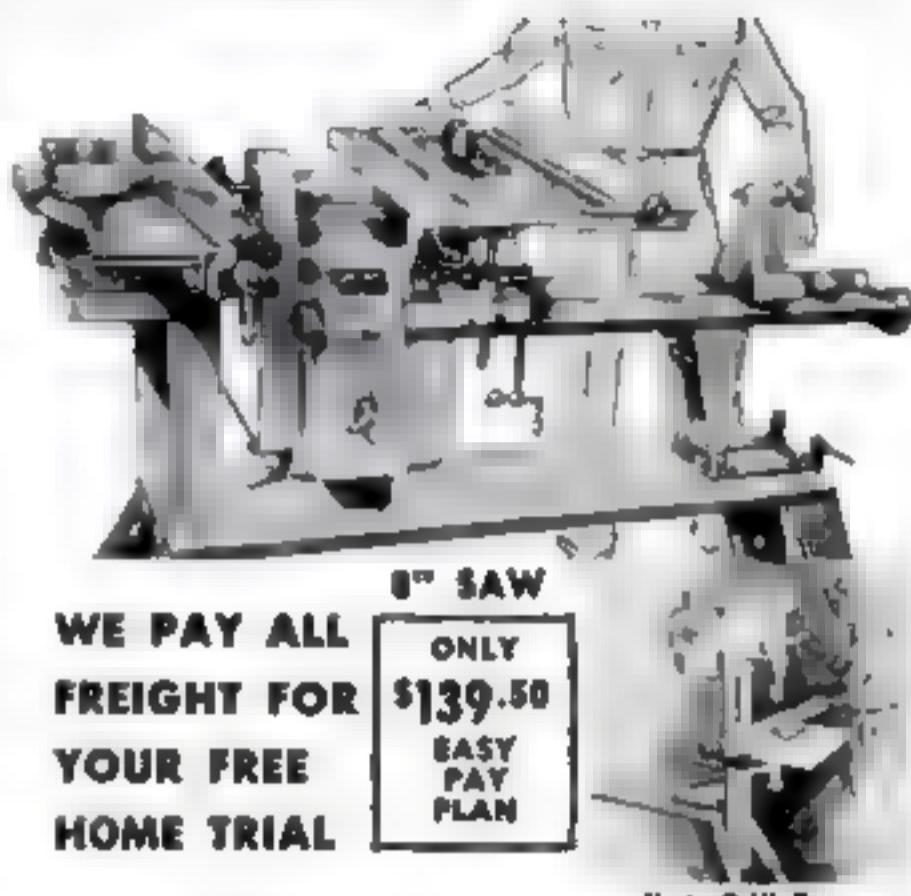
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Form angles, locks, pans, etc. New eccentric clamps. All steel construction. Size 15" 16 gauge steel \$23.50; 30" 22 ga \$39.50; 40" 24 ga. \$52.00. Stand \$8.00.

14" ac Metal Bender 16" size \$62.00
1" 12" Acute Turner \$13.20
Box & Compound 14" size \$29.00

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VYKE MFG. CO., 4156-N Jason St., Denver 11, Colo.



BUILD YOUR OWN POWER TOOLS - WITH GIL-BILT PARTS KITS



TI LT/ARBOR SAW

- 27x28 in. cabinet
- 131/2 in. rip table
- 30" cross of table
- 10" m. blade cuts 31/2 in. deep.
- 10" full 45 degrees
- Floor model 34" high table always stays level
- New "Depot" 1/2" universal arbor will receive any shaft turned down for 1/2" bore blades.
- About hours of assembly ready to run
- Jackscrews and 41/2 in. dia. handwheel lowers and raises table
- Last 1/2" from miter gauge and w/ adjustment the fence is 1/2 in.
- Gil-Bilt Parts Kit includes: Plans, 1/2" ball bearing arbor, miter gauge and bar, rip fence, guide dogs, insert, lock knobs, parking pawl mechanism and handwheel. And all other tools, parts, accessories
- Plans \$2.50
- Parts Kit with 12" Combination Blade \$22.95
- Parts Kit with 12" Circular Saw Blade \$25.90
- Parts Kit with 8" Combination Blade \$24.90

GIL-BILT 12-INCH BAND SAW

Belt bearing drive, shield cast aluminum wheel & rubber tires. Handles stock up to 8 inches thick. Cut a center of 31" circle. 12x18 inch cabinet, arbor and performance a 1/2" wide. Planer, rip and up. Plans and all metal parts in kit with 8" blade \$23.95. Reg. \$30. Reg. to 10 days for refund if not satisfied. For 10 percent up to 800 miles add 10% after 800 add 20%. Amount in excess of actual postage will be refunded. Order Kit now or order Plans at \$1.00 each and Kit later less cost of plans.

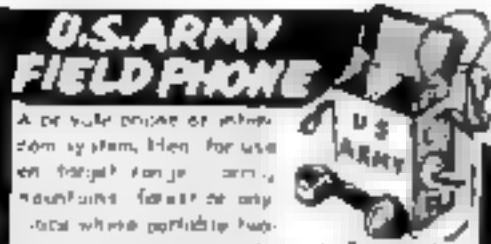
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Also Available: Plans & Parts Kits for 18" Band Saw, Belt Sander, Spindle Shaper, 8" Tilt Table Saw.



GILLION POWER TOOLS

Dept. 70-C, Lambert Field
St. Louis 23, Missouri



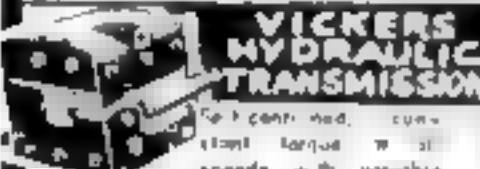
U.S. ARMY FIELD PHONE
A complete phone or intercom system. Men for use on target range, mountain, forest or any area where portable has top common usage. It consists of the famous EE-B radio phone used by success in the Korean Conflict, clear receive up to 35 miles. Uses two standard batteries. It consists of a carrying case and telephone or contained in the original heavy duty case. Price of these phones is based on one unit. Records checked out. Price per unit.

1495
2950



ARMY SURPLUS CAMP AXE
Top quality Mac 2 1/2' hardened handle. Extra sharp steel head. Complete with leather belt holder with snap-down cover. 1495

295



VICKERS HYDRAULIC TRANSMISSION
Self-contained, compact torque converter speed with variable volume reversible piston pump which supplies piston hydraulic motor. Has 2 HP Automatic pressure dash pot for smooth control. Power output 4.500 ft-lbs. Input HP in both directions. Input RPM 1200 continuous. Self-reversing lever for reverse. Dual motor setup on M-10 Carrier, Small Cars, Trucks, etc.

4950

4" SPLINE SHAFTS for input and power take-off as above. Per \$2.50

INPUT & TAKE-OFF PLATE ASSEM
To adapt Trans. to power drive. 104 1/2" diameter shaft. Weight 10 lbs.

2000 SET



ELECTRIC LINEAR ACTUATOR
Mfg'd by J. E. Clegg. Delivers 1000 pounds thrust and will withstand 100% torque load. Motor operates on 12 volts DC current at 11.5 ampere ratings at 750 RPM with 2 HP. The overall length approx. 12" x 3" inches.

995



4-WAY OPEN CENTER CONTROL VALVE
\$21.50
Not built-in adjustable air relief valve set in with disc spring loaded neutral position. For use with one double set in line valve may be mounted in series. Has 1/4" male inlet and outlet with 1/4" pipe thread cylinder ports. Shipping weight 1 lb.

SURPLUS BARGAIN
The 79 HYDRAULIC CYLINDER - It gives 20,000 pounds thrust using 100 psi. The pressure is delivered from one of our hydraulic pumps. Gives up to 80% less thrust with 3,000 Psi. Has a bore size of 2" stroke. Overall length 16" inches.

USED 2995 NEW 4395



SAVE 50% ON NEW VALLEY HYDRAULIC CYLINDERS
Send for Sales of HYDRAULIC CATALOG SUPPLEMENT Shows entire line of hydraulic equipment designed especially to fit the needs of industry. Also SAVE up to 85% on War Surplus Hydraulic Equipment including Pumps, Valves, Fittings, etc.

Palley's 1000 page catalog available. Order from this ad. Pay by MAIL OR CASH.
1000 items in catalog.



**FROM IMPORTER
SAVE 50%**
Buy direct from manufacturer. Price less than wholesale.

PHILIPPINE MAHOGANY PLYWOOD AT PRICES LESS THAN WHOLESALE

For Philippine Pine, Mahogany, etc. use in Cabinets, Furniture, etc. Plywood Cut. Both sides sanded.

179 SHEET
1/4" thick, 4x8 ft.
2500 FT.
MIN. ORDER
8 SHEETS

FREE SAMPLE ON REQUEST
1/4" thick, 4x8 ft.
995 SHEET
MIN. ORDER
2 SHEETS

SAVE 40% - TRANSLUCENT FIBERGLASS PANELS

For a family sized family room, sunroom, sunroom, etc. in 7'6" lengths and widths. More colors to choose from. Write for FREE

495 FT

QUALITY WOOD LEGS WITH BRASS TIPS
BUILD OR RESTYLE YOUR FURNITURE
Beautifully turned, fully seasoned hardwood legs. Smoothly rounded and complete with polished brass tips on sturdy feet including in the Available Furniture or just a chair. Price will vary to fit in. Order Silver Fox, Mahogany, or Walnut finish. Please specify finish. Price per set of 4 with Brass Tip.

SIZE	FINISHED	UNFINISHED	SIZE	FINISHED	UNFINISHED
4"	\$2.65	\$2.15	10"	\$6.48	\$3.95
6"	3.00	2.45	12"	4.75	4.45
8"	3.55	3.00	14"	5.25	4.75
12"	3.95	3.45	20"	8.75	5.35

3400 RPM-1/2 HP POWER SAW

RIPS - CROSSCUTS
CUTS A FINISHED 2x4 LIKE A KNIFE THROUGH BUTTER

COMPARE TO
SAWS SELLING
UP TO \$49.50
1998 Complete with
5 ft. blade

A rugged professional type saw cuts wood, metal, tile, brick, stone, etc. Cut any angle from 0 to 45 degrees. Includes 8 ft. 10" long 1/2" blade. Weight 6 lbs. Shipping weight 10 lbs. Satisfaction guaranteed.

SAVE UP TO 50% on SPORT DIVING EQUIPMENT

BUILD YOUR OWN DIVING LUNG

Our kit includes everything required to build your own diving lung. Includes: Air Pump, Pressure Regulator, Hose, etc.

Price: \$10.00 for materials, complete with pump, valves, etc.

Price for above \$17.00
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1 hour long
45.95
\$150.00 valve

FREE CATALOG
Has latest info on
Diving Equipment. Plus an illustrated and described
method on how to build your own Diving Lung.

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CONVERT ANY OUTDOOR FAUCET TO A DRINKING FOUNTAIN

How about having a convenient drinking fountain in your yard or out of doors? Attach directly to your regular faucet and you get a cool refreshing drink by pressing a button. DOESN'T COST A DIME with the use of your garden hose. Made of finished aluminum. The plastic base and float with a durable strong Plastic Panel.

FOR CHILDREN & ADULTS

ARMY CANTEEN & CUP BELT

Convenient & Attractive equipment. The one piece leather and aluminum cup belt fits most sizes. Made of heavy grade leather. Which has metal grommets for holding oil other gear.

IDEAL FOR BOY SCOUTS
ONLY 3.95

ARMY SURPLUS WADING SUIT

Covers the entire body from the neck down. Protects you from mud water, etc. Completely designed for outdoor work in the heavy lands of heavy duty rubberized cotton with reinforced seams. Not

bulky. Rubber boots and gloves. Sizes: Small Med. and large \$35.00 each.

GOLO KNIFE
100% Quality steel
long, complete with
sheath belt sheath. Lg. 198

ARMY PICNIC BOTTLE
100% Quality steel
also head with rubber is on
the side neck on other. Lg. 198

ONLY 1.98

Order from this ad. Pay by MAIL OR CASH.

to deposit with CASH.

All prices FOB Los Angeles.

AIR CORPS SEXTANT

Can be used for any navigational purpose. Contains many valuable optical lenses. Precision gears do all spring motor, bubble level, etc. Can be used as a compass with spirit plastic bags.

1795



SPECIAL VARIABLE SPEED DRIVE

Originally part of the turret gun & driving mechanism. A very valuable piece of precision machinery. Contains a gear reduction box, several bronze gears, a main drive, many ball bearings, etc. This unit provides precise controlled output power which may be increased while in operation. Forward and reverse output speed may be controlled to exact tolerances. Can be adapted to many uses in machine tools, where great constant or variable output power is required. Study Drive and inquire on existing drives you have.

29.95

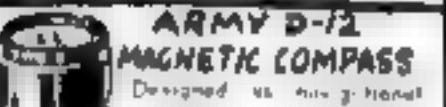


GENUINE AMERICAN AVIATORS GOGGLES

Two year vision goggle. Interchangeable lenses. Four choices of 4 lens colors - clear, amber or green. Frames are rubberized with soft lining. Lining and built-in non-slipning lens retarders. Adjustable nose & chin strap. Hand finished. A must for all aviators.

24.95

EXTRA LENSES extra charge
100.00



ARMY D-12 MAGNETIC COMPASS

Designed as a navigation equipment for Army Aircraft. for navigating long range routes, calibrated in degree increments from 0 to 360. Two parallel grid wires for alignment. For use in Aviation. 100 ft. 100 ft. 100 ft.

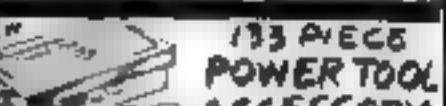
9.95



SELSYN TRANSMITTER MOTOR

A synchronous AC motor. The most unique type of electric motor used in aviation with constant rotation for indefinite time ideal for power purposes. 100 ft. 100 ft. 100 ft.

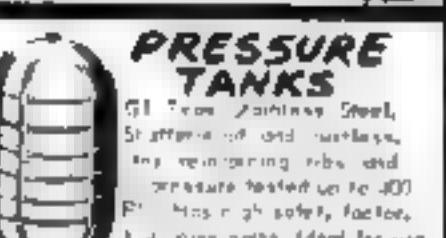
14.95



133 PIECE POWER TOOL ACCESSORY SET

This complete accessory set for the shop job. Can be used with any electric drill or grinder. Contains 133 pieces including great polish cut off & buffing wheels, sanding discs, sheet cutters, mandrels, burnish mounted stones and knife edge rubber wheels. A very handy set for the model builder or other hobby work more times the price.

19.95



PRESSURE TANKS

Oil free stainless steel. Shatter proof and stainless. Very reinforcing ribs and pressure test up to 400 psi. High safety factor. 100 ft. 100 ft. 100 ft. Ideal for use in the shop or underwater fishing, boating, swimming, etc. A good item for water sports. Size 6" x 22" stainless steel.

12.95

Corrosion Resistant Steel TANK
No. D-2 500 cu. in. capacity
3.95

Corrosion Resistant Steel TANK
No. D-2 300 cu. in. capacity
3.95

Corrosion Resistant Steel TANK
No. D-2 200 cu. in. capacity
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Corrosion Resistant Steel TANK
No. D-2 100 cu. in. capacity
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Corrosion Resistant Steel TANK
No. D-2 50 cu. in. capacity
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No. D-2 25 cu. in. capacity
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Corrosion Resistant Steel TANK
No. D-2 10 cu. in. capacity
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Corrosion Resistant Steel TANK
No. D-2 5 cu. in. capacity
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Corrosion Resistant Steel TANK
No. D-2 2 cu. in. capacity
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Corrosion Resistant Steel TANK
No. D-2 1 cu. in. capacity
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Corrosion Resistant Steel TANK
No. D-2 0.5 cu. in. capacity
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No. D-2 0.25 cu. in. capacity
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Corrosion Resistant Steel TANK
No. D-2 0.05 cu. in. capacity
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No. D-2 0.02 cu. in. capacity
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Corrosion Resistant Steel TANK
No. D-2 0.00005 cu. in. capacity
3.95

Corrosion Resistant Steel TANK
No. D-2 0.00002 cu. in. capacity
3.95

Squeezing More Power from Coal

[Continued from page 267]

nomical rate of 1,000,000,000 tons every year. This new plant, and others like it, will make it possible to obtain the same tremendous amount of power from only one-third the coal."

Over the last 35 years, constantly increasing pressures and temperatures, and other technical improvements, have saved about 3,000,000,000 tons of coal over what would have been burned without this progress. Meanwhile, the average cost of electricity to the consumer has been going steadily down. When the Lakeside plant opened in 1920, the average domestic user throughout the U.S. paid 7.45 cents a kilowatt-hour; since then the price has gradually dropped to an estimated 2.65 cents for 1955—a decrease of 65 percent.

Savings: \$128 a year. More and more electric home devices—refrigerators, freezers, water heaters, ranges, mixers, washers, dryers, room coolers, space heaters, radio and TV sets—have been adopted, until today the average family uses about eight times as much electric power as in 1920.

If this power were still sold at 1920 rates, the average homeowner's bill for electricity would be about \$128 a year higher than it is today.

By no means has all this saving been brought about by fuel economy. Increased sales of any mass-produced commodity tend to lower production costs,

and other important savings have been brought about by larger plants, labor-saving automatic controls, more efficient distribution and improved methods of handling customer accounts. But in the face of rising coal costs, the new economical plants are reducing fuel to a smaller and smaller item in the total cost of producing electric power.

A mark to shoot at. And the engineers have not yet reached the ceiling in their long drive to squeeze more power out of coal. It is theoretically possible, if metals can be found that will stand the gaff, to boost steam pressures and temperatures to a point where less than half a pound of coal will make a kilowatt-hour—one-sixth of the amount needed by the average plant in 1920.

Today this is regarded as highly speculative, but engineers have no intention of missing a bet.

Some time much of our power may come from nuclear fission, hydrogen fusion, solar energy or some new chemical process. Large sums are being spent exploring these possibilities. But the tremendous demands of the power-hungry boom give the utility industry no time to wait for such developments. Every 10 years they must install as much new capacity as has been installed in all past history. So every year they are spurring the "new power" pioneers by giving them a still tougher mark to shoot at. END

NEXT MONTH... PSM 1956 Home Show



EVEN if your house is only five years old, it is likely to be obsolete today. New designs, new materials, new machinery make the '56 model a new kind of home. POPULAR SCIENCE MONTHLY for April will bring you a special report on new ideas in housing—a sparkling new building plan, an eye-opening glimpse into the future, and page after page devoted to ways in which you can modernize the house that you are living in now.



New! Just \$99⁵⁰!

World's only orbital-action bayonet saw!

Now—the first *real* improvement since portable jig saws were invented! It's Porter-Cable's revolutionary new Model 148—designed around a wholly new principle, guaranteed to outperform any other portable *jig saw at any price.*

Orbital action makes the difference. Blade teeth are in contact only on the cutting stroke—back away on the relief stroke. Harmful "drag" is completely gone—and performance reaches a new high.

By actual test, the Model 148 cuts up to 4 times faster than the best conventional up-and-down saws. It has a full 2" capacity in wood— $\frac{1}{4}$ " in aluminum, $\frac{1}{4}$ " in steel. Its cool, comfortable grip and perfect balance make easy work of any job. Get the whole amazing story from your Porter-Cable dealer—or write today for full information and name of your nearest Dealer.

Porter-Cable

Quality Electric Tools

PORTER-CABLE MACHINE COMPANY

6150 N. Salina Street, Syracuse 8, N. Y.

belt sanders • finishing sanders
saws • drills • routers • planes

In Canada write Porter-Cable, Ltd., Box 8810,
London, Ont. Canadian prices slightly higher.

New

SOUTH BEND PRECISION VERTICAL MILLING MACHINE



SPECIFICATIONS

Table travel.....	30 or 30"
Cross Feed.....	9½"
Spindle to table (max.).....	30"
Spindle to column (max.)..	22"
Ram travel.....	15"
Spindle speeds.....	8
Head rotation.....	360°

Adequate capacity, accuracy and speed give this new milling machine the ability to keep machining costs low on a wide variety of work. Its simplicity of design provides ease of accessibility and set-up. Reduces operation and job change-over time to a minimum. Ideal for toolroom, production and maintenance work. Write for information.

LO-LOSS spindle drive.
Precision ground and fitted quill.

Positive action controls
with large, adjustable, protected collars.

Power longitudinal
table feed and automatic
quill feed optional.



SOUTH BEND LATHE South Bend 22, Indiana
Builders of lathes, milling machines, shapers, drill presses, pedestal grinders



4 00000000000000000000000000000000

This One



DEFZ-P1W-LFW4

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FOR REPAIRING RADIO AND TV

The new Model 670-A

SUPER-METER



A COMBINATION
VOLT-OHM MILLIAMMETER
PLUS CAPACITY, REACTANCE,
INDUCTANCE AND DECIBEL
MEASUREMENTS

ADDED FEATURE:
Built-in ISOLATION
TRANSFORMER reduces
possibility of burning
out meter through misuse.

SPECIFICATIONS

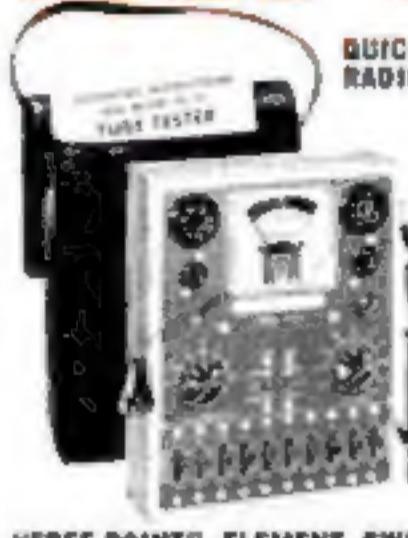
D.C. VOLTS: 0 to 7.5/15/75/150/750/1,500/7,500 Volts
A.C. VOLTS: 0 to 15/30/150/300/1,500/3,000 Volts
OUTPUT VOLTS: 0 to 15/30/150/300/1,500/3,000 Volts
D.C. CURRENT: 0 to 1.5/15/150 Ma. 0 to 1.5/15 Amperes
RESISTANCE: 0 to 1,000/100,000 Ohms 0 to 10 Megohms
CAPACITY: .001 to 1 Mfd. 1 to 50 Mfd. (Good-Bad scale for
checking quality of electrolytic condensers.)
REACTANCE: 50 to 2,500 Ohms 2,500 Ohms to 2.5 Megohms
INDUCTANCE: .15 to 7 Henries 7 Henries to 7,000 Henries
DECIBELS: -5 to +15 +14 to +38 +34 to +58

The Model 670-A comes housed, in a rugged crackle-finish steel cabinet complete with test leads and operating instructions.

28⁴⁰

The new Model TC-55

TUBE TESTER



QUICKLY AND EFFICIENTLY TESTS
RADIO AND TV TUBES INCLUDING:
SEVEN PIN MINIATURES;
EIGHT PIN SUBMINIARS;
OCTALS AND LOCTALS;
NINE PIN NOVALS

YOU CAN'T INSERT A TUBE
IN THE WRONG SOCKET.
It is impossible to insert
the tube in the wrong
socket when using the
new Model TC-55. Separate
sockets are used, one for
each type of tube base. If
the tube fits in the socket
it can be tested.

"FREE-POINT" ELEMENT SWITCHING SYSTEM. The Model TC-55 incorporates a newly designed element selector switch system which reduces the possibility of obsolescence to an absolute minimum. Any pin may be used as a filament pin and the voltage applied between that pin and any other pin, or even the "top-cap."

CHECKS FOR SHORTS AND LEAKAGES BETWEEN ALL ELEMENTS. The Model TC-55 provides a super sensitive method of checking for shorts and leakages up to 5 Megohms between any and all of the terminals.

ELEMENTAL SWITCHES ARE NUMBERED IN STRICT ACCORDANCE WITH R.M.A. SPECIFICATION. One of the most important improvements, we believe, is the fact that the 4 position fast-action snap switches are all numbered in exact accordance with the standard R.M.A. numbering system. Thus, if the element terminating in pin No. 7 of a tube is under test, button No. 7 is used for that test.

The Model TC-55 comes complete with operating instructions and charts. Use it on the bench—use it for field calls. A streamlined carrying case, included at no extra charge, accommodates the tester and book of instructions.

26⁹⁵

FOR REPAIRING ALL ELECTRICAL APPLIANCES MOTORS AND AUTOMOBILES



Handsome round-cornered molded bakelite case, 3 1/4" x 5 7/8" x 2 1/4". Complete with all test leads. Also included is a 64 page book giving detailed instructions for testing all electrical appliances, automotive equipment, etc.

Only

15⁸⁵

The New Model 70 UTILITY TESTER

As an electrical trouble shooter the Model 70:

- Measures A.C. and D.C. Voltages, A.C. and D.C. Current, Resistances, Leakage, etc.
- Will measure current consumption while the appliance under test is in operation.
- Incorporates a sensitive direct-reading resistance range which will measure all resistances commonly used in electrical appliances, motors, etc.
- Leakage detecting circuit will indicate continuity from zero ohms to 5 megohms (5,000,000 ohms).
- Will test Toasters, Irons, Broilers, Heating Pads, Clocks, Fans, Vacuum Cleaners, Refrigerators, Lamps, Fluorescents, Fans, Switches, Thermostats, etc.

As an Automotive Tester the Model 70 will test:

- Both 6 Volt and 12 Volt Storage Batteries • Generators
- Starters • Distributors • Ignition Coils • Regulators
- Relays • Circuit Breakers • Cigarette Lighters • Stop Lights • Condensers • Directional Signal Systems • All Lamps and Bulbs • Fuses • Heating Systems • Horns
- Also will locate poor grounds, breaks in wiring, poor connections, etc.

**EXAMINE BEFORE
YOU BUY!**

**Simply fill out and mail
postage-free Air Mail card**

CUT OUT AND MAIL TODAY!

IT'S A PSYCHOLOGICAL FACT: **PLEASURE HELPS YOUR DISPOSITION**

How's your disposition today?

EVER YIP LIKE A TERRIER when things go wrong? That's only natural. But — it's a psychological fact that pleasure helps your disposition! So, if you're a smoker, it's important to smoke the most pleasure-giving cigarette — Camel.



**For more pure
pleasure — have a
*Camel***

"I've tried 'em all,
but it's Camels for me!"
Rock Hudson



YOU CAN SEE RUGGED ROCK HUDSON STARRING IN U-F'S "NEVER SAY GOODBYE"



No other cigarette
is so rich-tasting
yet so mild!

R. J. REYNOLDS TOBACCO CO., WINSTON-SALEM, N. C.

ROCK HUDSON AGREES with Camel smokers everywhere: there is more pure pleasure in Camels! More flavor, genuine mildness! Good reasons why today more people smoke Camels than any other cigarette.

Remember this: pleasure helps your disposition. And for more pure pleasure — have a Camel!